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TECHNICAL MEMORANDUM 1
OPERABLE UNIT NO. 10
OTHER OUTSIDE CLOSURES

U.S. Department of Energy
Rocky Flats Environmental Technology Site
Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM

January 1995

Volume 1 - Text

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List of Acronyms and Abbreviations

ATSDR	Agency for Toxicity and Disease
BCF	bioconcentration factor
bgs	below ground surface
BHC	5-5 benzene hexachloride
BNA	base/neutral acid
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRC	Chemical Rubber Company
DCE	dichloroethene
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ERPD	Environmental Restoration Program Division
FIDLER	Field Instrument for the Detection of Low-Energy Radiation
FS	Feasibility Study
FSP	Field Sampling Plan
ft^2	square feet
g	gram
g/cm^3	gram per cubic centimeter
GC	gas chromatograph
GPS	Global Positioning System
HPGe	high purity germanium
IAG	Interagency Agreement
IHSS	Individual Hazardous Substance Site
kg	kilogram

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KOH	potassium hydroxide
L	liter
m	meter
MDA	maximum detectable activity
MDL	Method Detection Limit
mg/kg	milligrams per kilogram
ml	milliliter
MLE	Maximum Liklihood Estimation
mm	millimeter
MS	mass spectrometry
NaI	sodium iodide
NaOH	sodium hydroxide
NCRP	National Council on Radiological Protection
NFA	No Further Action
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PAM	Proposed Action Memorandum
PCA	tetrachloroethane
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PEA	Potential Early Action
ppb	parts per billion
ppm	parts per million
PPRG	Programmatic Preliminary Remediation Goal
PUD	Property Utilization and Disposal

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PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RF	Rocky Flats
RFEDS	Rocky Flats Environmental Data System
RFETS	Rocky Flats Environmental Technology Site
RFI	RCRA Facility Investigation
RI	remedial investigation
Rockwell	Rockwell International
ROD	Record of Decision
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SAFER	Streamlined Approach for Environmental Restoration
SOP	Standard Operating Procedure
SQL	sample quantitation limit
SVOC	semivolatile organic compounds
S&W	Swingerton and Wahlberg
TAL	target analyte list
TCA	trichloroethane
TCE	trichlorethylene
TCL	target compound list
TIC	tentatively identified compound
TOC	total organic carbon
UTL	upper tolerance limit
VOC	volatile organic compound

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VSP	vertical soil profiles
μg/g	micrograms per gram
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
μR/h	micro Roentges per hour
%	percent
±	plus or minus
1,1,1 TCA	1,1,1-trichloroethane
1,2-DCE	1,2-dichloroethene

EXECUTIVE SUMMARY

This document presents the results of the nonintrusive Phase I, Stage 1 field activities for Operable Unit No. 10 (OU10) at the U.S. Department of Energy Rocky Flats Environmental Technology Site. The nonintrusive field activities included surface radiological surveys, soil-gas surveys, nonradiological surface-soil sampling, and visual inspection of tank areas. These activities were conducted as part of the requirements from Work Plan for the Phase I, Stage 1 Resource Conservation and Recovery Act Facility Investigation/Comprehensive Environmental Response, Compensation, and Liability Act Remedial Investigation.

The purpose of this Technical Memorandum is to describe the field activities, present analytical results, and make recommendations for disposition of the Individual Hazardous Substance Sites (IHSS). The IHSSs characterized from the field investigation in OU10 are as follows:

- Oil Leak (IHSS 129);
- Property Utilization and Disposal (PUD) Storage Yard - Waste Spills (IHSS 170);
- PUD Container Storage Facilities (IHSSs 174A and B);
- S&W Building 980 Container Storage Facility (IHSS 175);
- S&W Contractor Storage Yard (IHSS 176);
- Building 885 Drum Storage Area (IHSS 177);
- Building 334 Cargo Container Area (IHSS 181);
- Buildings 444/453 Drum Storage Area (IHSS 182);
- Building 460 Sump #3 Acid Side (IHSS 205);
- Inactive D-836 Hazardous Waste Tank (IHSS 206);
- Inactive Building 444 Acid Dumpsites (IHSS 207);
- Unit 16, Building 980 Cargo Container (IHSS 210);

- Unit 15, 904 Pad Pondcrete Storage (IHSS 213); and
- Unit 25, 750 Pad Pondcrete and Saltcrete Storage (IHSS 214).

This OU10 Technical Memorandum No. 1 discusses investigation methods and specific activities. A brief history of each IHSS presents pertinent historical data and facility uses. The analytical data were summarized and data statistically assessed for each IHSS to determine whether a sufficient number of samples was collected for a thorough characterization.

Based on findings from the analytical summary and statistical database summary, recommendations were developed. These recommendations were compared with the preliminary evaluation and remedial categorization from the *Proposed Plan for Reorganization and Remediation of the Industrial Area Operable Units at the Rocky Flats Environmental Technology Site* (DOE 1994a). That preliminary evaluation document was designed to consider potential changes from previously planned work scopes resulting from collecting and analyzing new data.

Analytical results for IHSS 129 were not available for inclusion in this draft. Additional sampling to define horizontal and vertical boundaries of contaminants in support of preliminary early-action remediation was recommended for IHSSs 170, 174A, 174B, 175, 176, 177, and 182. Additional sampling to characterize the nature and extent of contaminants was recommended for IHSSs 213 and 214. Nonintrusive sampling could not be conducted at these IHSSs until the storage facilities become inactive. IHSSs 205, 207, and 208 were recommended for decontamination and decommission. IHSS 210 was recommended for a limited amount of additional sampling to confirm a recommendation for no further action. IHSS 181 was recommended for no further action. Details for sampling methods, number, and exact locations of samples will be included in the OU10 Phase I Stage 2 Work Plan.

1.0 INTRODUCTION

Preparation of this document meets the Phase I, Stage 1 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI)/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation (RI) Work Plan requirements to present the results of the nonintrusive Phase I, Stage 1 activities for Operable Unit (OU) No. 10 at the U.S. Department of Energy (DOE) Rocky Flats Environmental Technology Site (RFETS) located in Golden, Colorado (Figure 1-1). Figure 1-2 illustrates the site location and local topography. The nonintrusive Phase I (screening level) activities include surface radiological surveys (i.e., high purity germanium [HPGe] and sodium iodide [NaI] surveys), soil-gas surveys, nonradiological surface-soil sampling, and tank inspection/sampling. This document also proposes areas for additional investigation to verify radionuclide hot spots; and volatile organic compounds (VOCs); it also includes a statistical surface-soil sampling program for nonradionuclides to be conducted in Phase I, Stage 2 to further characterize the Individual Hazardous Substance Sites (IHSSs) in OU10.

Phase I, Stage 1 activities are being conducted under the Phase I RFI/RI for OU10. The work is part of a comprehensive, multistaged program of site characterization, feasibility studies (FS), and remedial/corrective actions currently in progress at RFETS. These activities are pursuant to an Interagency Agreement (IAG) among DOE, the U.S. Environmental Protection Agency (EPA), and the State of Colorado Department of Public Health and Environment (CDPHE), dated January 22, 1991 (DOE et al. 1991). The IAG program addresses both RCRA and CERCLA requirements. The purpose of this Technical Memorandum is to report analytical results and make recommendations for subsequent stages of the RFI/RI based on the analytical data.

Figure 1-1 Location Map of Rocky Flats Environmental Technology Site

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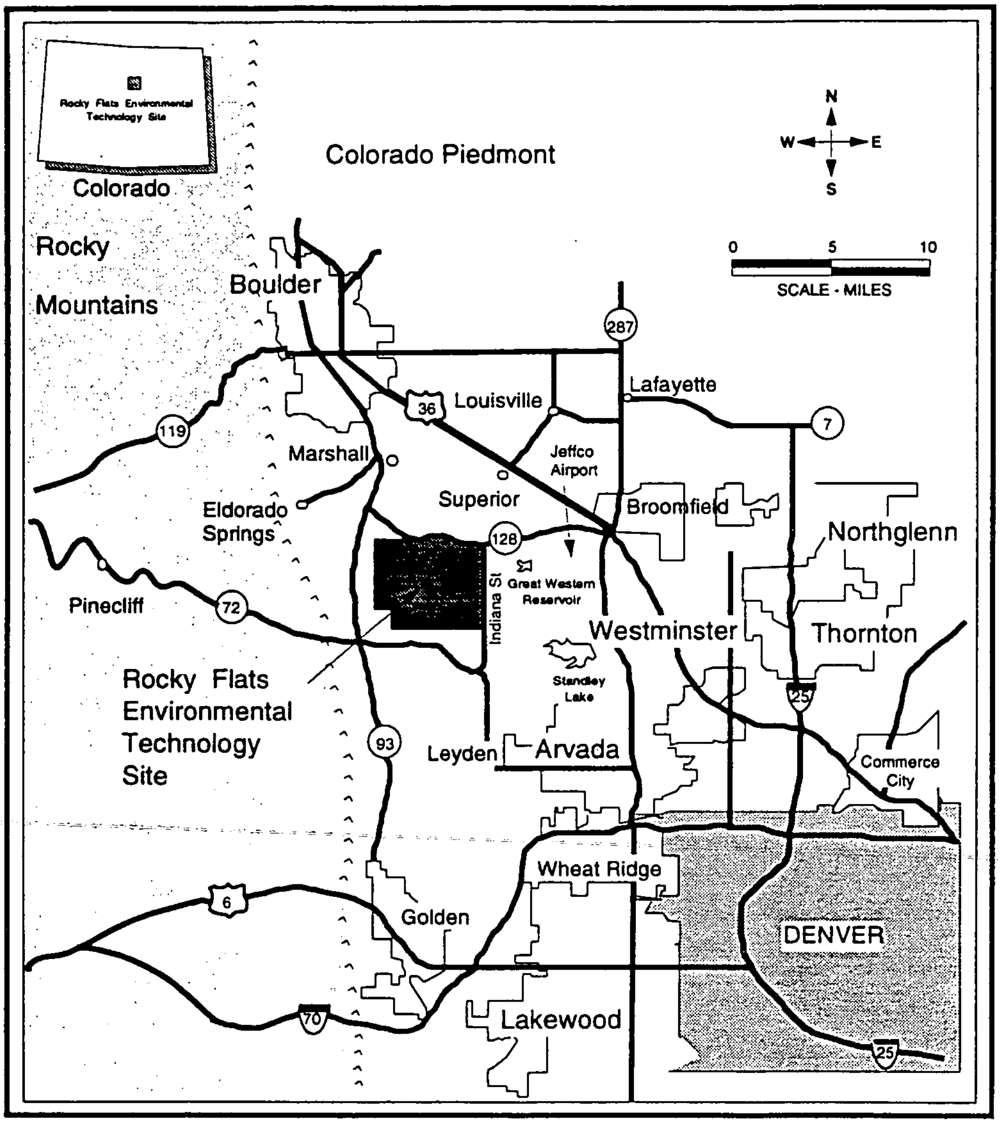

Figure 1-1 Location Map of Rocky Flats Environmental Technology Site

Figure 1-2 Rocky Flats Environmental Technology Site

1.1 BACKGROUND

OU10 comprises 15 IHSSs located throughout the RFETS Industrial Area. The IHSSs include areas that were used as drum storage areas, surface storage areas for surplus materials, former locations of aboveground tanks, former locations of cargo containers containing drums, the former location of a combined drum surface storage and cargo container area, and an underground storage tank. Figure 1-3 shows the locations of the 15 IHSSs in OU10. Specific descriptions of each IHSS are in Section 3.0 of this report.

IHSSs at OU10 were evaluated in a draft document called the *Proposed Plan for Reorganization and Remediation of the Industrial Area Operable Units* (DOE 1994a). All IHSSs of the Industrial Area OUs were evaluated against a standard set of criteria and categorized to assist in identifying those IHSSs that are candidates for closure or accelerated cleanup. This categorization allowed for the expedited risk-based closure of the Industrial Area IHSSs by issuing a decision equivalent to a Record of Decision (ROD) for each IHSS or group of IHSSs before issuing RODs for each Industrial Area OU. The categorization process was designed to manage potential changes of previously planned work scopes based on the collection of new data. In this Technical Memorandum, results of the OU10 Phase I, Stage 1 activities are evaluated with particular consideration given to the remedial categories. Because this is closely linked with IHSS recommendations, a more detailed discussion of the categorization outlined in the *Proposed Plan for Reorganization and Remediation of the Industrial Area OUs* (DOE 1994a) is provided with IHSS recommendations in Section 6.0 of this report.

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Figure 1-3 Operable Unit 10, Individual Hazardous Substance Sites

1.2 PURPOSE AND SCOPE

The following are the purposes of this technical memorandum:

- Describe the field activities implemented during the nonintrusive Phase I, Stage 1 activities.
- Present results from all nonintrusive activities for characterization of the OU10 IHSSs.
- Perform a statistical assessment of surface-soil data to examine data adequacy.
- Discuss in general contaminant fate and transport based on existing information.
- Present a summary of findings.
- Relate findings to the categorization of IHSSs in the *Proposed Plan for Reorganization and Remediation of the Industrial Area Operable Units* (DOE 1994a).
- Identify data needs and make recommendations for subsequent stages of the RFI/RI.

The Phase I, Stage 1 activities for OU10 were designed to detect contamination at each IHSS primarily using nonintrusive or limited intrusive screening-level surveys. These surveys were intended to provide an assessment of the presence or absence of contamination, and to be a step toward defining the nature and extent of the contamination that is present. The following are the activities that were undertaken for the Phase I, Stage 1 activities:

- visual inspections;
- surface radiological surveys;
- surface-soil sampling;
- soil-gas surveys;
- tank residue sampling;
- vertical soil profiles; and
- tanks and ancillary equipment testing, inspections, and investigations.

This document presents the results of these inspections, surveys, and sampling events for each individual IHSS. All results of the surface radiological survey are included as appendices or tables. After the activities for Phase I, are completed, a comprehensive RFI/RI document will be prepared to summarize the findings and fulfill the initial objectives of the RFI/RI as defined in the *OU10 RFI/RI Work Plan* (DOE 1992a).

2.0 METHODS OF INVESTIGATION

This section describes the investigative methodologies used during the data collection activities for Phase I, Stage 1 activities for OU10 and provides figures showing the sampled locations.

2.1 HIGH PURITY GERMANIUM SURVEY

The HPGe surveys were conducted in accordance with Environmental Restoration Program Division (ERPD) Standard Operating Procedure (SOP) GT.30 (EG&G Rocky Flats, Inc. [EG&G] undated). An HPGe detector is a semiconductor radiation detector that measures *in situ* low energy X-ray and gamma-ray emitting radionuclides in soil. The HPGe detector has a broad energy range and exhibits high resolution, excellent gain stability, moderate area averaging, and the ability to identify and quantify all gamma-emitting radionuclides. The HPGe detector allows detection and calculation of radionuclide activities in soil in picocuries per gram (pCi/g) of gamma-emitting radionuclides including, but not limited to, potassium-40; radium-226; thorium-232; cesium-137; americium-241; plutonium-239 and -241; and uranium-233, -234, and -235. The nominal detection diameter for the instrument is approximately 144 feet for the HPGE radionuclides, assuming a uniform vertical distribution throughout the top 3 centimeters of soil and a detection height of 21 feet above the ground. This field of view represents the circular area where 90 percent of the gamma rays originate that contribute to photo peak counts. The draft HPGe results obtained to date, which include the percent error and Field of View information for all OUs at RFETS, are included in Appendix A to this document. However, *in situ* HPGe technology at RFETS is in its infancy and therefore has as yet unresolved issues involving calibration, it implementation, and validity of results. While in situ HPGe technology shows promise for identifying and quantifying specific radionuclides without the delay and expense of laboratory analysis, all data presently generated must be viewed as qualitative and should be used with discretion.

2.2 SODIUM IODIDE SURVEYS

The NaI scintillation detector, also referred to as Field Instrument for Detection of Low Energy Radiation (FIDLER), is used for detecting gamma photons. The detector consists of a single crystal of sodium iodide to which a small amount of thallium has been added. The detector has a narrow field of view of approximately 1 foot in diameter when held 2 inches above the ground. This instrument is designed to measure low-energy gamma-rays and X-rays, which are characteristic of americium and plutonium. The procedure for use of the FIDLER at RFETS is outlined in SOP FO.16 (DOE 1992b). However, the FIDLER cannot distinguish sources of gamma-rays and X-rays. Therefore, the FIDLER instrument is used as a screening tool to qualitatively identify potential sources of americium an plutonium.

NaI surveys were conducted at each sample point for health and safety purposes. Readings at the soil-gas locations were also used for evaluation of any potentially anomalous HPGe areas in OU10 and specifically at IHSSs 174A, 174B, 175, 177, 181, 182, and 207. The records for the NaI surveys are found in the OU10 field forms.

2.3 VISUAL INSPECTIONS

A site reconnaissance of the 15 IHSSs in OU10 was conducted to characterize local physical conditions. In addition to confirming possible hazards such as overhead utilities, areas of potentially affected media were also noted. In particular, areas of stressed vegetation, soil staining, and pavement/concrete staining were noted through visual inspections. In IHSSs where a specific sampling grid was not specified by the *OU10 RFI/RI Work Plan* (DOE 1992a), surface-soil samples were located based on these visual inspections.

2.4 SURFACE-SOIL SAMPLING

Surface-soil samples were collected from locations specified in Section 7.0, Field Sampling Plan (FSP), of the *OU10 RFI/RI Work Plan* (DOE 1992a). Table 2-1 summarizes the analytes for IHSS surface-soil sampling.

Two methods of surface-soil sampling were employed during Phase I. In unpaved areas, the Rocky Flats (RF) Method was used, and in areas where pavement or concrete covered the ground surface, grab samples were collected after first cutting a hole through the asphalt or pavement with an electric coring device. Both grab sampling and RF Method sampling were conducted in accordance with ERPD SOP GT.08 (EG&G 1993). It should be noted that IHSSs 170 and 174 were sampled using the 10-point composite RF Method. The RF Method was modified to require a five-point composite for the remaining IHSSs because the 10-point composite sampling method produced an excessive volume of soil.

2.5 SOIL-GAS SURVEYS

Soil-gas samples were collected from locations specified in Section 7.0, Field Sampling Plan, of the *OU10 RFI/RI Work Plan* (DOE 1992a). The samples were collected in accordance with ERPD SOP GT.09 (EG&G 1992b), and samples were analyzed using EPA Method 524.2

Fourteen analytes and the target detection limits specified in the *OU10 RFI/RI Work Plan* (DOE 1992a) are provided in Table 2-2. Analytes and target detection limits in Table 2-2 are used for screening data in the data summary discussion (Section 3.0) of this technical memorandum.

Before soil-gas surveys were conducted, all sampling locations were cleared for underground utilities. Small diameter stainless-steel probes were driven either hydraulically or with an

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TABLE 2-1 List of Analytes for Surface-Soil Samples from Each OU10 IHSS at Rocky Flats Environmental Technology Site

TABLE 2-2 Phase I Investigation for Soil-Gas Parameters electric rotary hammer into the soil to a depth of 5 feet below the ground surface. A vacuum was then applied to the probe to induce air flow. The soil-gas samples were collected in adsorbent cartridges that were transported to a mobile laboratory.

3.0 DATA SUMMARY

This section presents the results of data collection activities for the initial phase of the Phase I, Stage 1 activities for OU10.

3.1 DATA EVALUATION

Analytical results for the various sampling activities were obtained from the Rocky Flats Environmental Data System (RFEDS). Each activity undertaken at the OU10 IHSSs is introduced and an overview of the approach to the data use is provided.

3.1.1 High Purity Germanium Survey

The HPGe gamma-radiation detector survey for OU10 reported radioactivity in pCi/g of surface-soil for potassium-40, cesium-137, radium-226, thorium-232, uranium-235, uranium-238, americium-241, and plutonium-239. One-hundred-eighteen OU10 locations had radionuclides in surface-soils measured by HPGe detectors. To assess whether the results of the HPGe analyses were elevated above natural background activities, a literature search was conducted to identify reasonable background activities to be used for comparison against the HPGe data. The background activity ranges identified as a result of this research are contained in Table 3-1. Of particular importance in this table are the radionuclide data that were collected during the Background Geochemical Characterization Program (DOE 1993a), which was conducted in areas adjacent to the site during the early 1990s. For the most part, these site-specific background values fall within the range of background activities identified in the literature research. As noted in Table 3-1, the maximum background activities for americium and plutonium are based on the known presence of these radionuclides in the environment at RFETS and are therefore above actual background from fallout of nuclear air testing. However, uranium-235 and

TABLE 3-1
Background Activities of Specific Radionuclides for the Denver Metropolitan Area and RFETS

Radionuclide	Background Activity (pCi/g)	Source	Maximum Background Based on Wet Chemistry Analysis (pCi/g)*	Maximum Background Activity Based on HPGe Remote Analysis (pCi/g)
Potassium-40	1.89-21	Henderson (1982) Faure (1977) NCRP (1987)	NR†	12.8
Radium-226	0.017-1	Henderson (1982) EG&G (1992b) NCRP (1987)	0.96	1.13
Thorium-232	0.99-1.35	Henderson (1982) NCRP (1987)	NR†	1.25
Uranium-238	1.08-1.78	Henderson (1982) NCRP (1987)	1.79	2.30
Uranium-235	0.01-0.09	NCRP (1987) EG&G (1992b)	0.11	0.10
Cesium-137	0.01-1.37	Henderson (1987) EG&G (1990) EG&G (1992b) Faure (1977)	0.14	0.84
Americium-241	0.01-1.0**	EG&G (1992b) CDPHE (1992) Henderson (1987)	0.02	0.10
Plutonium-239 & 240	0.009-5**	EG&G (1992b) CDPHE (1992) Henderson (1987)	0.02	††

Notes:

CDPHE = Colorado Department of Public Health and Environment
HPGe = high purity germanium
NCRP = National Council on Radiological Protection
pCi/g = picocuries per gram

* These numbers reported in the *Background Geochemical Characterization Report, Rocky Flats Plant, Golden, Colorado* (DOE 1993a).
** These maximum numbers are above "background" or fallout levels and are based on the known presence of these radionuclides in the environment at Rocky Flats.
† NR = Not Reported.
†† HPGe technology only capable of measuring this radionuclide in the nanocurie-per-gram range.

uranium-238 are noted to be slightly more elevated in the site-specific background data. The HPGe data for OU10 were generated on an IHSS-specific basis; thus, the results of this survey are also discussed on an IHSS-specific basis. However, HPGe data are also presented on Plate 1, which shows the Industrial Area contoured by americium-specific activity.

The HPGe data were generated for screening purposes to help identify areas that are potentially contaminated with any of a variety of radionuclides. In general, the HPGe detector is considered extremely accurate in the identification of the presence of specific radionuclides because of the resolution of its gamma spectrum. However, the HPGe detector is relatively inaccurate in the quantification of the total quantity of radionuclides present. Furthermore, as indicated in Section 2.1, the *in situ* HPGe technology at RFETS is still being formed to eliminate the limitations that have been identified. The *in situ* HPGe data may not accurately represent radionuclide activity in the soils because of "Shine," emanation of radiation from buildings that house radioactive waste near the test location or from contaminated equipment stored near the test location and because higher than expected reading nearby. Additionally, other site characteristics can affect results, such as irregular or sloping topography, soil density, and uniformity of distribution with the soil of the sources. Hence, these factors, as well as many others, limit the velocity of the *in situ* HPGe, data; all such data should be treated as qualitative and be interpreted using discretion appropriate for any screening data.

A brief description of the various radionuclides measured and reported by the HPGe detector follows.

- Potassium-40. Potassium-40 is a naturally occurring radionuclide that was not used in significant quantities at RFETS. However, potassium-40 above background activities may be present in RFETS soils because of the use of Polar Melt® de-icer, which is composed of potassium chloride. Potassium chloride has a 0.0117 percent natural abundance of potassium-40. In March 1992, a report titled *Possible Gross Beta Affects to Rocky Flats Plant's Storage Ponds Due to Polar Melt De-icer Usage* (EG&G 1992a) was released that evaluated how the usage of Polar Melt® affected gross beta activities in the drainage ponds. The activity of Polar Melt® was estimated to average 53 pCi/g or 24,040 picocuries per pound (pCi/lb). A total of 62,350 pounds of Polar Melt® was used during the 1990-1991 snow season. Conclusions of the study indicated that 14.3 to 41.9 percent of the gross beta in the pond system during 1990-1991 could be attributed to Polar Melt® runoff. The average contribution of gross beta by Polar Melt® in the ponds was expected to be 1.9 picocuries per liter (pCi/L) with contributions ranging as high as 3.9 pCi/L in March 1991 (EG&G 1992a). Background activities of potassium-40 could be expected to range up to 21 pCi/g. HPGe data for potassium-40 were generated primarily for calibration purposes of the HPGe detector. Nothing in the history of the IHSSs at OU10 leads to the conclusion that potassium-40 might be in excess of natural background concentrations at any of the OU10 IHSSs because of radionuclide or hazardous waste contamination. The few elevated potassium-40 concentrations detected were located in the general vicinity of paved roads or ditches that drain paved roads; thus, these elevated concentrations could be attributed to Polar Melt®, which is not considered to be a hazardous waste.

- <u>Radium-226</u> Radium-226 is a naturally occurring radionuclide. The range of background values generated by HPGe detector for this radionuclide range up to 1.13 pCi/g. HPGe data for radium-226 were generated primarily for HPGe detector calibration purposes and for comparison of the total activities of radium-226 and uranium-238 in the surface-soils. Nothing in the history of the IHSSs at OU10 leads to the conclusion that Radium-226 might be present in excess of natural background concentrations at any of the OU10 IHSSs.

- Thorium-232. Thorium-232 is the most abundant of the naturally occurring isotopes, approximately three times as abundant as uranium and approximately as abundant as lead and molybdenum (Cember 1978; Chemical Rubber Company [CRC] 1980). Background activities of thorium-232 could be expected to range up to 1.35 pCi/g. Nothing in the history of the IHSSs at OU10 leads to the conclusion that thorium-232 might be present at any of the OU10 IHSSs.

- Uranium-238. Uranium-238 is a radionuclide that was used at RFETS. Background activities of uranium-238 could be expected to range up to 1.79 pCi/g based on wet-chemistry analysis. Many of the HPGe-generated numbers exceed the expected maximum activity of uranium-238 in the general RFETS area based on wet-chemistry measurements. The maximum background activity of uranium-238 generated to date by HPGe detector is 2.3 pCi/g. This 2.3 pCi/g was used as an initial flag for possible anomalous uranium-238.

Once potentially anomalous uranium-238 activities were identified, further analysis of the data was conducted by the evaluation of the ratio of radium-226 activity over uranium-238 activity. Radium-226 is a daughter product of uranium-238 and has a half-life of 1,600 years versus the 4.51×10^9 year half-life of uranium-238. Thus, in naturally occurring materials, these two radionuclides should be in secular equilibrium, barring other influences. In secular equilibrium, the total activity of radium-226 and uranium-238 should be approximately equal (Cember 1978; Faure 1977) and the ratio of the activities should be near unity. However, based on HPGe-generated data for background soils, this ratio is considerably less than unity in all cases. For background areas, the ratio varies from 0.35 to 0.51 for HPGe-generated data. Thus, in this evaluation, ratios of radium-226 to uranium-238 activity that exceed 0.35 are considered to be indicative of naturally occurring uranium-238 activities. In summary, only uranium-238 activities that exceed 23 pCi/g and are present with radium-226 in ratio of less than 0.35 (radium to uranium) will be identified as anomalous.

The history of uranium-238 usage at RFETS indicates that uranium-238 could be found in the general vicinities of Buildings 331, 444, 881, 883, 964, and the Solar Evaporation Ponds. Building 444 is near IHSSs 182, 208, 207, and 205. Building 881 is near IHSS 177. The Solar Evaporation Ponds are west of IHSS 176. Building 964 is east of the Solar Ponds and stores radioactively-contaminated saltcrete. A significant quantity of the uranium-238 values that were anomalously high were correlated with distance from the Solar Ponds, Building 964, and Building 444. "Shine," is believed to account for many of the elevated uranium-238 activities.

- Uranium-235. Uranium-235 is a radionuclide with a very low abundance in comparison to total naturally occurring uranium. Background activities of uranium-235 could be expected to range up to 0.11 pCi/g based on wet-chemistry analyses. Based on HPGe-generated data, the background activities for uranium-235 could range up to 0.10 pCi/g. The history of uranium-235 usage at RFETS indicates that this material could be found in excess of natural background activities in the general vicinities of Buildings 881 and 883.

- Cesium-137. Cesium-137 is a man-made radionuclide that is found in surface-soils because of fallout deposition of cesium-137 from atmospheric testing of nuclear weapons. Areas at which soils have remained undisturbed in recent years could have cesium-137 activity up to 1.37 pCi/g. Areas in which soils have been disturbed would have lower activities of cesium-137 because of the mixing of cesium-137 in surface-soils with less contaminated deeper soils. Nothing in the history of the IHSSs at OU10 leads to the conclusion that cesium-137 might be present in excess of fallout activities at any of the OU10 IHSSs.

- Americium-241. Americium-241 is a man-made radionuclide that is a daughter product of the radioactive decay of plutonium-241 that is present in the plutonium handled at RFETS. Americium has been detected historically at RFETS and above-background concentrations of americium can be found at RFETS. For the purposes of this evaluation, only americium values above 0.1 pCi/g were considered to be potentially anomalous. In addition, many of these locations were considered to be elevated because of "shine" from buildings that either handled plutonium- or plutonium- and americium-contaminated waste. Plate 1 illustrates the location of americium activity compared to OU10 IHSSs.

- Plutonium-239. Plutonium-239 is a man-made radionuclide that has been used in numerous machining, casting, and chemical operations at RFETS. Plutonium has been detected historically at RFETS and is present at concentrations above background. The minimum detectable activity for plutonium-239 with the HPGe detector used at RFETS is relatively high (on the order of nanocuries per gram). Plutonium-239 values greater than 0 nanocuries per gram are usually considered to be anomalous; however, the anomalous HPGe results for OU10 can be attributed to influence of "shine" from the low level waste storage areas, which may contain plutonium-239-contaminated waste. One example is Building 964, which stores radioactively contaminated saltcrete.

NaI surveys were conducted at every soil-gas location in OU10 as part of a health and safety requirement. These NaI surveys were also used for the evaluation of any potentially anomalous HPGe areas. Vertical soil profile samples were not required based on the results of the HPGe and NaI surveys. All HPGe results for all the OUs sampled are listed in Appendix A.

3.1.2 Surface-Soil Sampling

Table 2-1 summarizes the analytes for surface-soil sampling. The analytical results of surface-soil sampling were used to characterize contamination at each IHSS by identifying detected analytes including those analytes reported as estimated concentrations below the method detection limit (MDL), examining the frequency of detection of detected analytes, delineating locations and areas of chemical detection, and identifying areas that may be of potential concern for future investigation. Areas of contamination that may be of potential concern were identified by comparing reported concentrations with chemical-specific background levels and risk-based concentrations (RBCs). Background data for inorganics in surface-soil were obtained from the *OU6 Technical Memorandum No. 4, Chemicals of Concern, Human Health Risk Assessment, Walnut Creek Priority Drainage* (DOE 1994b). The background data used are results of sampling in the Rock Creek area during the 1991 OU1 Phase III investigation and the 1993 OU2 Phase II investigation. For each analyte, an upper tolerance limit (UTL) with 99 percent confidence and 99 percent coverage ($UTL_{99/99}$) was calculated assuming the background data were normally distributed (DOE 1994b). Surface-soil concentrations were compared with the $UTL_{99/99}$ reported in the OU6 technical memorandum (DOE 1994b).

RBCs were obtained from the *Programmatic Risk-Based Preliminary Remediation Goals for the Rocky Flats Plant* (DOE 1994c). Programmatic preliminary remediation goals (PPRGs) have been calculated for various scenarios at RFETS to obtain contaminant- and medium-specific levels of exposure that protect human health. Ecological effects were not considered in the development of PPRGS. RBCs used to evaluate surface-soil results are the PPRGs developed for the residential exposure scenario that examined exposure via the soil ingestion pathway. The residential PPRGs were used because the calculated surface-soil concentrations are the lowest, or most conservative, concentrations among the various surface-soil exposure scenarios assessed.

If both an RBC and a background concentration were available for an analyte (e.g., for most of the inorganic analytes), comparison to the higher of the two concentrations was emphasized. This helps prevent characterization of existing background levels as site contamination and removes the consideration of potential risks associated with naturally occurring levels. Background is assumed to be zero for organic analytes. When an RBC is not available for a particular analyte, it is assumed to be zero. RBCs were used where available.

An average concentration of the detected analytes was calculated from data for each IHSS using positive reported values including estimated, or "J" qualified, concentrations, and using one-half the sample quantitation limit (SQL) for samples reported as nondetects. In determining the frequency of detection of a particular analyte, one duplicate sample result was selected over the other according to the following criteria:

- the higher of two positive values was used; or
- a positive value was used over a reported SQL; or
- the lower of two SQLs was used.

Tables presenting sampling results for each IHSS are presented with the data summary text and in Appendix B. The following tables were compiled for surface-soil sampling conducted at each IHSS:

1. complete surface-soil dataset for the IHSS including duplicate samples (Appendix B);

2. data table showing only the detected analytes, associated MDLs from the *OU10 RFI/RI Work Plan* (DOE 1992a), and reported positive results, including estimated concentrations, with the comparison to background and RBCs (introduced with summary text);

3. data summary table for the detected analytes including MDLs, range of SQLs and associated locations, range of detected concentrations and associated locations, frequency of detection, and the average concentration of collected samples (with summary text);

4. data summary table (similar to that in No. 3 above) for all analytes (Appendix B); and

5. tentatively identified compounds (TICs) for each IHSS (Appendix B).

Figures and plates that show surface-soil sampling locations and concentrations of analytes detected at the various IHSSs, respectively, have also been developed. These graphical representations of the data are cited throughout the report. Seventeen plates have been prepared for this draft report. Each plate contains plotted concentrations of detected analytes. Inorganics shown are those concentrations that exceeded background levels. Organic analytes were grouped for ease in presentation. The plates indicate locations where RBCs were exceeded. These areas may be considered areas of potential concern for future investigation.

The polynuclear aromatic hydrocarbons (PAHs) were separated into two groups for presentation on plates: carcinogenic PAHs and noncarcinogenic PAHs. The PAHs were grouped primarily because PAHs were the most frequently detected organic analytes at the OU10 IHSSs and to improve identification of areas of concern and characterization of chemical migration (discussed in Section 5.0). In general, carcinogenic PAHs have a higher molecular weight, are less soluble, and are more likely to adsorb to organic material in soil. Carcinogenic PAHs also have lower, or more conservative, RBCs than the noncarcinogenic PAHs. Benzo(a)pyrene has the most conservative RBC of all the PAHs and exceeded the RBC more often than any of the other detected PAHs. This analyte is therefore of particular interest when identifying areas of concern and was plotted separately with PCBs (Aroclor-1254 and -1260), which also frequently exceeded their associated RBC. Other less-frequently detected organics were grouped together on a separate plot within each plate.

All available surface-soil data were obtained from the RFEDS database. Data for surface-soil samples were validated for IHSSs 170, 174A, 174B, 175, 176, 208 and 210. Analytical results from surface-soil samples collected at IHSS 129 were not received in time to include in this Draft Technical Memorandum. Surface-soil data for IHSSs 177 and 206 were not validated at the time of report preparation.

For the invalidated results compounds (marked with a "?") not requiring a dilution were reported from the original analysis, while results for compounds requiring dilution were reported from the diluted analysis. Invalidated results reported less than the SQL were assumed to be nondetect, except analytical results that were estimated by the laboratory indicated by ("J"), "J" value and results or were greater than the SQL were assumed to be positive detections.

The available data validation results do not suggest systematic analytical problems. The "V" validation descriptor indicates that the data are valid. Those data reported as estimated "J" by the laboratory or data validation firm were below the reportable detection limit. Some data were rejected ("R") as a result of data validation: 0.8% of the semivolatile (BNA) data, 2.0% of the target analyte list (TAL) metal data, 2.0% of the pesticides/polychlorinated biphenyls (PCBs) data, and 0.7% of the on-TAL metal.

Overall, data were determined to meet the data quality objectives. The percentage of surface-soil data rejected was 1 percent of all surface-soil data. Twenty-one percent of the data were qualified as estimated. In additional reviews, performed on a compound-by-compound basis, 43 percent of the Aroclor-1016 analyses was rejected. Because this rejector level is unacceptable, the Aroclor-1016 data were not used.

Duplicate samples were analyzed to monitor field sampling representativeness and any potential laboratory error. A summary of the field rinsates for all the rinsates collected in OU10 are provided in Table B-42 of Appendix B. A summary of the field duplicate results is provided in Table B-44 of Appendix B. Some sample and corresponding duplicate data contained contaminants that were found in the laboratory method blanks and estimated "J", such as bis(2-ethyl hexyl) phthalate. For those sample and duplicate data that were above the detection limit and not qualified for blank contamination, a high degree of correlation was observed. Although no specific goal was established for duplicate data results, the RPD was less than 30 percent for most of the sample and duplicate results. The following sample and duplicate data exceeded a relative percent difference (RPD) of 30 percent:

IHSS	Sample Location	Sample	Duplicate	Analyte	RPD
174B	SS001893	SSG1085JE	SSG1116JE	nickel	33.2
176	SS009393	SSG1142JE	SSG1176JE	chromium	41.1
176	SS009393	SSG1142JE	SSG1176JE	lead	92.8

The volume of data for this data set is not large enough to statistically evaluate this information completely. However, overall observations of these data suggest that the above data are outliers and should be treated as estimated data.

Equipment rinsates were analyzed to evaluate the field decontamination procedures. These data are presented in Appendix B. The data were reviewed for nonestimated positive detections to determine potential field contamination by comparing the results with the associated field sample (quality control [QC] partner). All equipment rinsate blank data were adequate, and the data are acceptable for their intended use.

The data provided for the laboratory replicates results were not validated because the data validation process does not include an evaluation of laboratory replicates. Data also were not qualified for laboratory replicate results. No additional evaluation was conducted by the data users.

Data results for soil physical parameters were not available at the time of report preparation but are discussed in general terms in Section 5.0. Results for pH and total organic carbon (TOC) were available and have been included with the IHSS datasets in Appendix B.

3.1.3 Soil-Gas Survey

Results of the soil-gas survey were used for site characterization as a screening technique to identify VOCs that exceeded the target detection limit of 1.0 micrograms per liter (μg/L). The target detection limit of 1.0 μg/L and the 14 target compounds also specified in the *OU10 RFI/RI Work Plan* (DOE 1992a) specified in the OU10 Work Plan are listed in Section 2.0, Table 2-2 of this technical memorandum. Soil-gas tables in this section are limited to only the 14 target compounds exhibiting concentrations that exceeded the target detection limit of 1.0 μg/L. All sample results from soil-gas EPA Method 524.2, including any detection below 1.0 μg/L and/or nondetects, are listed in Table C-1 of Appendix C. All QC samples are listed in Table C-2.

Detection limits of one-tenth (0.1) μg/L of the target detection limit were used as guidelines for the mobile laboratory. Field laboratory chemists flagged all data associated with method blank contaminants with a "B." These data were assessed and no significant bias was found for blank contaminants. In any case where a blank value was detected above the action level of 1.0 μg/L, the task manager requested resampling for all associated sample locations. The mobile laboratory reported all analytical results. Values found to be outside the linear calibration range were flagged as "J," indicating an estimation by the field chemists.

Typical field procedures included collecting only a one-liter volume of soil-gas for the majority of sample locations. However, in some instances where substantially high concentrations of VOCs were suspected, 100 milliliter (mL) and 10 mL samples were collected in addition to the one-liter sample.

Although all data were taken into account, the data users evaluated the data provided by the laboratory to determine the most reliable results. In cases where more than one result was reported and no qualifier was provided by the mobile laboratory, an attempt to choose the best result was performed by first examining the dilution factors. An "*" symbol was used to indicate the best result for concentrations of analytes compared with the dilution factors detected in the one liter, 100 mL, or the 10 mL samples. If a dilution factor could not be used to differentiate the best value, the highest concentration reported of the samples in question was used for the soil-gas data assessment.

Hydrogen sulfide and methane are two of the 14 target compounds listed in Table 2-2. These two compounds were not analyzed by EPA Method 524.2 because they do not adhere to the trap materials used to collect soil-gas samples in the field. Hydrogen sulfide and methane were therefore collected by alternate analytical procedures. Hydrogen sulfide was analyzed using a portable field instrument (Gastech Model 4320 HS). Methane was analyzed using the portable Gastech field instrument to determine combustible gas content. The detection limit is five parts per million (ppm) for hydrogen sulfide and 20 ppm for methane. However, estimated concentrations of 10 ppm were reported for detections of methane. The reestablished detection limits were reviewed and were sufficient to meet data quality needs.

All sample results were evaluated by the task manager onsite to ensure the data generated by the mobile laboratory during the soil-gas survey met the project requirements and data quality needs according to the parameters defined in the Quality Assurance Addendum, Section 10.0 of the *OU10 RFI/RI Work Plan* (DOE 1992a). In addition, the mobile laboratory operations and procedures were audited by CDPHE and DOE chemists. These audit findings primarily addressed the calibration criteria of plus or minus (±) 50 percent. The auditors noted that SW-846 methodology that specifies ±30 percent criteria were not followed by the laboratory personnel. After review of the actual calibration results generated, the field laboratory chemists determined that a majority of calibration check compounds met the ±30 percent criteria. The project-specific criteria of ±50 percent provided a sufficient output of analytical results and the highest quality of data achievable. No data validation was performed for this data set because the level provided was field analytical Level II. The data generated for the soil-gas survey met their intended use by providing a preliminary assessment for site characterization.

In the following sections soil-gas data are presented in tables and on plates that display all data that exceed the target detection limit of 1.0 ug/L, except for methane and hydrogen sulfide. For methane, values reported are those that exceed the instrument detection level of 20 ppm and estimated values of 10 ppm. For hydrogen sulfide values reported are these that exceed the instrument detection level of 5 ppm.

3.2 IHSS 129 - OIL LEAK

IHSS 129 is the No. 4 Fuel Oil Tank that is the southernmost of four tanks located near Building 443. The No. 3 and No. 4 tanks are no longer in use. Tanks No. 1 and No. 2 to the north are still used as "day tanks" by Building 443. The top of the No. 4 carbon-steel tank is approximately 4 feet below grade and is oriented lengthwise east to west. It is 11 feet in diameter by 27 feet in length with a total storage capacity of 19,000 gallons (DOE 1992a).

Five underground lines consisting of one steam line, one return condensation line, a pump line (to pump fuel oil), a return line (for fuel oil), and one line connected to supply tanks are connected to Tank No. 4 (DOE 1992a).

Tank No. 4 was primarily used to store #6 fuel oil from 1967 to 1984; however, #2 diesel oil was also stored in the tank during the 1970s. It was also used to store a waste mixture of compressor oil and water from 1984 to 1986 and solvent for fuel oil spills from 1967 to 1986. Tank No. 4 use was discontinued in 1986 after evidence of potential leakage was discovered.

The contents of the tank were removed, although sludge may remain in the lines and the tank (DOE 1992a).

Fuel spills of #6 fuel associated with the four #6 fuel oil tanks were reported in 1967, 1968, and 1977, and a possible leak was reported in 1986. Additionally, in 1989, spills totaling 2,250 gallons from the other three tanks were reported near IHSS 129 (DOE 1992a).

Previous investigations indicate VOCs, trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), methylene chloride, and trichlorofluoromethane were detected from samples collected after leakage was discovered in 1986. The Closure Plan for Tank No. 4 indicates that the tank was a potential source for leakage. The Closure Plan also indicates traces of 1,1,1-TCA and methylene chloride were detected in groundwater but overall groundwater was not impacted by leakage or spills at Tank No. 4.

During previous investigations, soil samples were collected from borings drilled to help characterize the tank area for closure. The analytes for these samples included VOCs, BNA, and metals. Results indicate the presence above detection limits for organics including 1,1,1-TCA, methylene chloride, benzene, toluene, ethylbenzene, and total xylenes. Metals detected include aluminum, arsenic, beryllium, calcium, cadmium, chromium, copper, iron, mercury, magnesium, nickel, potassium, lead, vanadium, and zinc (DOE 1992a).

Tanks No. 3 and No. 4 are being inspected and removed under the Proposed Action Memorandum (PAM); however, soil-gas sampling was delayed because of conflicts with the implementation of the PAM. Further characterization for nature and extent of contamination is performed under OU10. Soil-gas samples will be collected during Phase I, Stage 2 sampling. After resolution of the specific field activities that would be performed under the PAM, surface-soil samples were collected in the last part of the OU10 Stage 1 field activities. Analytical results from surface-soil samples collected at IHSS 129 are presented in Section 3.2.2.

3.2.1 High Purity Germanium Survey

The HPGe survey data for the two survey locations near IHSS 129, which overlap with OU13 IHSSs 191 and 157.1, provided no evidence to indicate anomalous activities for radium-226, uranium-235, uranium-238, americium-241, or plutonium-239 at IHSS 129. Although activities for potassium-40 and thorium-232 slightly exceeded the background values identified in Table 3-1, these radionuclides are not expected to be caused by anthropogenic sources at the site; therefore, they are not considered anomalous. Plate 1 display the americium concentrations. HPGe locations for IHSS 129 are illustrated on Plate 1, Americium Specific Activity Map.

3.2.2 Surface-Soil Sampling

Analytical results are not yet available from surface-soil locations sampled at this IHSS. Surface-soil data will be presented in Tables 3-2 and 3-3 and discussion of the data will be included in the final draft. Figure 3-1 in the final draft will present the surface-soil sample locations for IHSS 129 and concentrations will be illustrated on Plate 2.

3.3 IHSS 170 - PROPERTY UTILIZATION AND DISPOSAL STORAGE YARD

The Property Utilization and Disposal (PUD) Storage Yard has been used since 1974 to store containers such as barrels, drums, cargo boxes, and dumpsters. Materials known to have been stored there include spent batteries, metal shavings coated with lathe coolant, and drums of spent solvents such as paint thinners and waste oils. The approximately 225-foot by 830-foot site is surrounded by wire fencing. Scrap metal that may not have undergone decontamination and drums were stored on the eastern third of the site. Drummed hazardous material was also transferred in this area. The central portion of the site was used to store equipment, including stainless-steel tanks, and dumpsters containing hazardous material that were transferred in the central area of the site. In addition, a pile of stainless-steel scrap and machining cuttings was

TABLE 3-2 Surface-Soil Positive Results, OU10 - IHSS 129

(No Data received yet)

Table 3-2 will be included in the Final Technical Memorandum.

TABLE 3-3 **Surface-Soil Positive Results Data Summary, OU10 - IHSS 129**

Table 3-3 will be included in the Final Technical Memorandum.

located in the southeastern portion of the central area. The western third of the site was used to store undefined excess property (DOE 1992a).

Contamination may exist from historical spills associated with past hazardous material transfer operations and storage at the site. Releases of battery acids and leaks from dumpsters and drums of spent solvents and waste oils have been reported. Precipitation collected in open or unsecured drums was placed in six tanks during a preliminary cleanup effort at the site. Approximately 1,800 gallons of liquid waste were collected, eventually pumped to drums, and removed from the site. One tank, which had radiation measurements exceeding shipping criteria, was removed from the area. Some soil staining has been observed near the middle of the site where a dumpster containing machined steel was situated (Rockwell International [Rockwell] 1986).

Previous soil or water sampling investigations could not be identified for IHSS 170, although the tanks used to collect accumulated precipitation were sampled (DOE 1992a). Organic compounds detected in the tanks included acetone, methyl ethyl ketone, ethylene dichloride, Freon 113, ethyl acetate, trichloroethane, tetrachloroethane (PCE), and toluene. Inorganics detected included aluminum, calcium, iron, potassium, and sodium.

3.3.1 High Purity Germanium Survey

The HPGe survey data for 46 locations within and adjacent to IHSS 170 provided no evidence to indicate anomalous activities for potassium-40, radium-226, thorium-232, uranium-235, uranium-238, americium-241, or plutonium-239 at IHSS 170. These results were further confirmed by the NaI detector before surface-soil and soil-gas sampling. HPGe locations for IHSS 170 are illustrated on Plate 1, the Americium Specific Activity Map.

3.3.2 Surface-Soil Sampling

Thirty-seven surface-soil samples were collected from 35 locations in and around IHSS 170. Figure 3-2 shows the surface-soil sample locations. Twenty-five samples were collected on a triangular grid. Nine additional samples were collected in the area of staining near the center of the site (SS005293 through SS005993) and two samples were collected outside the IHSS boundary (SS004593 and SS006293). Duplicate samples were collected at locations SS005893 and SS007493.

Complete analytical results for IHSS 170 are included in Appendix B. Table 3-4 lists all detected constituents and their reported concentration by sample location. The table also provides the MDLs background concentrations and RBCs, indicating which sample analytes exceed either reference concentration. Table 3-5 summarizes the following information for detected analytes: the MDL, the reported range of SQLs for each analyte with the associated sample locations, the range of detected concentrations for each analyte with the associated sample locations, the frequency of detection, and the average site concentration of each analyte.

Forty-eight analytes were detected at IHSS 170, including 24 organics and 24 inorganics. As shown in Table 3-5, the organics detected at the site are primarily PAHs. Several phthalate esters and benzoic acid were also detected. Of the detected analytes, three organic compounds do not have RBCs available. These include 4-chloro-3-methylphenol (given as an estimated concentration at one sample location and in its duplicate), benzo(g,h,i)perylene, and phenanthrene. The latter two are PAHs and were detected at numerous locations. RBCs were also not available for lead, iron, magnesium, calcium, or potassium. Only two analytes exceeded the available RBCs. These are benzo(a)pyrene and Aroclor-1254.

TABLE 3-4
Surface-Soil Positive Results
OU10 - IHSS 170

Sample Location:			SS004393	SS004493	SS004593	SS004693	SS004793	SS004893	SS004993	SS005093	SS005193	SS005293	SS005393
Sample Identification Number:			SSG1042JE	SSG1043JE	SSG1044JE	SSG1045JE	SSG1046JE	SSG1047JE	SSG1048JE	SSG1049JE	SSG1050JE	SSG1051JE	SSG1052JE
Date Sampled:			28-Dec-93	28-Dec-93	28-Dec-93	29-Dec-93	29-Dec-93	28-Dec-93	3-Jan-94	29-Dec-93	10-Jan-94	6-Jan-94	6-Jan-94
Test Group:BNACLP Units:µg/kg	MDL	RBC / BKGND											
4-CHLORO-3-METHYLPHENOL	330	0.00E 0 / 0.00E 0		40 J:A-									
ACENAPHTHENE	330	1.65E 7 / 0.00E 0					52 J:A				75 J:A		
ANTHRACENE	330	8.23E 7 / 0.00E 0					86 J:A		60 J:A		99 J:A		
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0	64 J:A		46 J:A	120 J:A	240 J:A	73 J:A	130 J:A		260 J:A		
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0	62 J:A				230 J:A*		130 J:A*	58 J:A	270 J:A*		
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0	160 J:A				420 :V		500 :V	110 J:A	410 :V		
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0					75 J:A-				77 J:A-		
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0					89 J:V		130 J:A		180 J:A		
BENZOIC ACID	1600	1.10E 9 / 0.00E 0	100 J:A				120 J:A		170 J:A	90 J:A			
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0	60 J:A	260 J:A	71 J:A	610 :V	53 J:A	84 J:A	97 J:A	62 J:A			950 :JA
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0	60 J:A				39 J:A				69 J:A		
CHRYSENE	330	8.77E 4 / 0.00E 0	120 J:A	93 J:A	56 J:A	150 J:A	340 J:A	110 J:A	530 :V	66 J:A	300 J:A		
DI-n-BUTYL PHTHALATE	330	2.74E 7 / 0.00E 0											
DI-n-OCTYL PHTHALATE	330	5.49E 6 / 0.00E 0				62 J:A							
FLUORANTHENE	330	1.10E 7 / 0.00E 0	160 J:A	120 J:A	110 J:A	250 J:A	680 :V	190 J:A	610 :V	140 J:A	570 :V		
FLUORENE	330	1.10E 7 / 0.00E 0					44 J:A				65 J:A		
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0					83 J:A				130 J:A		
NAPHTHALENE	330	1.10E 7 / 0.00E 0									53 J:A		
PHENANTHRENE	330	0.00E 0 / 0.00E 0	66 J:A-	110 J:A-	54 J:A-	170 J:A-	380 :V-	110 J:A-	200 J:A-	65 J:A-	450 :V-		
PYRENE	330	8.23E 6 / 0.00E 0	170 J:A	230 J:A	120 J:A	330 J:A	540 :V	230 J:A	540 :V	120 J:A	630 :V	53 J:A	
Test Group:METADD Units:mg/kg													
LITHIUM	100	0.00E 0 / 20.00E 0	6.8 :JA	6.9 :JA	7 :JA	5.7 :JA	7 :JA	6.6 :JA	6.6 I:JA	5.5 :JA	3.8 :JA	8 :V	7.1 :V
MOLYBDENUM	200	9.64E 0 / 40.00E 0											
STRONTIUM	200	1.65E 5 / 90.10E 0	12.9 :JA	15 :JA	20.6 :JA	17.3 :JA	15.3 :JA	17.6 :JA	14.5 :V	9.2 :JA	11.4 :JA	11.4 :V	9.5 :V
TIN	200	0.00E 0 / 75.90E 0				3.4 :JA			1.8 :V				
Test Group:PESTCLP Units:µg/kg													
4,4'-DDT	16	1.88E 3 / 0.00E 0											
AROCLOR-1254	160	8.32E 1 / 0.00E 0							180 :V*				
HEPTACHLOR EPOXIDE	8	7.04E 1 / 0.00E 0											
beta-BHC	8	3.56E 2 / 0.00E 0		11 :V									
Test Group:SMETCLP Units:mg/kg													
ALUMINUM	200	0.00E 0 / 21915.40E 0	6700 :V	7250 :V	8530 :V	6750 :V	7840 :V	8390 :V	6650 :V	4740 :V	4660 :V	7770 :V	6960 :V
ARSENIC	10	3.66E-1 / 12.90E 0	4.1 :V*	5.3 :V*	9 :V*	5.6 :V*	6.3 :V*	7.1 :V*	4.3 :V*	2.6 :V*	3.4 :V*	4.4 :V*	3 :V*
BARIUM	200	1.92E 4 / 528.00E 0	68.3 :V	83.2 :V	112 :V	81.9 :V	85.7 :V	110 :V	68.1 :V	55.3 :V	46.2 :V	79.3 :V	68.7 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0						.52 :V	.37 :V		.36 :V	.35 :V	.31 :V
CADMIUM	5	1.37E 2 / 5.00E 0	.49 :V	.84 :V	1 :V	1.2 :V	.73 :V	.97 :V	1.1 :V	.53 :V	12.3 :V#	1.3 :JA	.57 :JA
CALCIUM	5000	0.00E 0 / 13573.30E 0	1910 I:JA	2290 I:JA	3050 I:JA	3450 I:JA	2000 I:JA	2330 I:JA	2020 :V	1410 I:JA	1650 :JA	1710 :V	1500 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	9.5 :V	10.2 :V	11.6 :V	9.8 :V	10.5 :V	12 :V	13.7 :V	8.6 :V	9 :V	12.6 :V	11.6 :V
COBALT	50	0.00E 0 / 24.80E 0	4.5 :V	4.8 :V	5.1 :V	4.8 :V	4.6 :V	5.1 :V	5.4 :V	4.4 :V	3.2 :V	5.3 :V	4.9 :V
COPPER	25	1.10E 4 / 27.30E 0	18.3 :V	25.3 :V		24 :V	21.1 :V	20.7 :V	23.5 :V				20 :V
IRON	100	0.00E 0 / 28160.40E 0	10100 :V	10600 :V	10600 :V	10100 :V	10300 :V	10400 :V	12900 :V	9650 :V	8990 :V	10900 :V	9950 :V
LEAD	3	0.00E 0 / 61.40E 0	31.9 :JA	47 :JA	47 :JA	34.2 :JA	32.2 :JA	49.1 :JA	103 :V#	22.1 :JA	19.7 :V	33.8 :V	18.7 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	2020 :V	1910 :V	1640 :V	1610 :V	1790 :V	1580 :V	2210 :V	1850 :V	1040 :V	2160 :V	2140 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	247 :V	235 :V	263 :V	255 :V	253 :V	307 :V	278 :V	207 :V	138 :JA	300 :V	228 :V
MERCURY	0.2	8.23E 1 / 0.20E 0											
NICKEL	40	5.49E 3 / 26.90E 0	5.7 :V	6.5 :V	7.5 :V	7 :V	6.8 :V	7.3 :V	16.4 :V	5.5 :V	6.2 :V	7.7 :V	8.2 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	2270 :V	2200 :V	2090 :V	1690 :V	2110 :V	2200 :V	2210 :V	2090 :V	1070 :V	2490 :V	2350 :V
SILVER	10	1.37E 3 / 10.00E 0										.44 :V	.46 :V
SODIUM	5000	0.00E 0 / 1108.00E 0									165 :V		
VANADIUM	50	1.92E 3 / 55.60E 0	21.2 :V	18.8 :V	29.3 :V	22.6 :V	21.5 :V	23.4 :V	20.5 :V	13 :V	14.9 :V	21.6 :V	26.8 :V
ZINC	20	8.23E 4 / 86.60E 0	47.5 I:JA	60.8 I:JA	55.6 I:JA	91 I:JA#	47.8 I:JA	58 I:JA	70.9 :V	55.6 I:JA	135 :V#	74.5 I:JA	52.8 I:JA

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TABLE 3-4
Surface-Soil Positive Results
OU10 - IHSS 170

Sample Location:			SS005493	SS005593	SS005693	SS005793	SS005893	SS005893	SS005993	SS006093	SS006193	SS006293	SS006393
Sample Identification Number:			SSG1053JE	SSG1054JE	SSG1055JE	SSG1056JE	SSG1057JE	SSG1126JE	SSG1058JE	SSG1059JE	SSG1060JE	SSG1061JE	SSG1062JE
Date Sampled:			5-Jan-94	6-Jan-94	6-Jan-94	5-Jan-94	5-Jan-94	5-Jan-94	5-Jan-94	4-Jan-94	3-Jan-94	4-Jan-94	4-Jan-94
Test Group:BNACLP Units:µg/kg	MDL	RBC / BKGND											
4-CHLORO-3-METHYLPHENOL	330	0.00E 0 / 0.00E 0					67 J:A-	83 J:A-					
ACENAPHTHENE	330	1.65E 7 / 0.00E 0											
ANTHRACENE	330	8.23E 7 / 0.00E 0									41 J:A		
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0								140 J:A	130 J:A		
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0								150 J:A*	110 J:A*		61 J:A
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0								260 J:A	210 J:A		92 J:A
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0								76 J:A-			
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0									79 J:A		
BENZOIC ACID	1600	1.10E 9 / 0.00E 0	180 J:A			110 J:A					170 J:A		
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0		4900 :JA		58 J:A				1400 :V	280 J:A	67 J:A	980 :V
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0											
CHRYSENE	330	8.77E 4 / 0.00E 0								200 J:A	130 J:A		83 J:A
DI-n-BUTYL PHTHALATE	330	2.74E 7 / 0.00E 0											140 J:A
DI-n-OCTYL PHTHALATE	330	5.49E 6 / 0.00E 0											
FLUORANTHENE	330	1.10E 7 / 0.00E 0					71 J:A		59 J:A	340 J:A	310 J:A	42 J:A	150 J:A
FLUORENE	330	1.10E 7 / 0.00E 0											
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0											
NAPHTHALENE	330	1.10E 7 / 0.00E 0											
PHENANTHRENE	330	0.00E 0 / 0.00E 0								160 J:A-	190 J:A-		85 J:A-
PYRENE	330	8.23E 6 / 0.00E 0					160 J:A		53 J:A	440 :V	260 J:A		130 J:A
Test Group:METADD Units:mg/kg													
LITHIUM	100	0.00E 0 / 20.00E 0	8.3 :V	5.7 :V	7.2 :V	6.9 :V	6.7 :V	6.9 :V	8.3 :V	7.2 I:JA	6.7 I:JA	5.8 I:JA	7.3 I:JA
MOLYBDENUM	200	9.64E 0 / 40.00E 0		6.5 :V						9.1 :V	6.6 :V	19.1 :V*	
STRONTIUM	200	1.65E 5 / 90.10E 0	16.6 :V	8.2 :V	11 :V	13.5 :V	10.3 :V	11.4 :V	15.8 :V	18.5 :V	17.7 :V	16.4 :V	15.7 :V
TIN	200	0.00E 0 / 75.90E 0								6.3 :V			3.2 :JA
Test Group:PESTCLP Units:µg/kg													
4,4'-DDT	16	1.88E 3 / 0.00E 0											
AROCLOR-1254	160	8.32E 1 / 0.00E 0									330 :V*		
HEPTACHLOR EPOXIDE	8	7.04E 1 / 0.00E 0											
beta-BHC	8	3.56E 2 / 0.00E 0											
Test Group:SMETCLP Units:mg/kg													
ALUMINUM	200	0.00E 0 / 21915.40E 0	8960 :V	4900 :V	6350 :V	6680 :V	5610 :V	5890 :V	9080 :V	8630 :V	8500 :V	6940 :V	8240 :V
ARSENIC	10	3.66E-1 / 12.90E 0	6.5 :V*	2.4 :V*	4.2 :V*	4 :V*	2.4 :V*	2.4 :V*	7.3 :V*	5.5 :V*	7.2 :V*	6.5 :V*	6.2 :V*
BARIUM	200	1.92E 4 / 528.00E 0	95.6 :V	56.8 :V	73.7 :V	77.3 :V	58.1 :V	62.8 :V	96.8 :V	88.7 :V	110 :V	112 :V	96.6 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.53 :V	.25 :V	.32 :V	.38 :V	.26 :V	.22 :V	.54 :V	.47 :V	.52 :V	.5 :V	.5 :V
CADMIUM	5	1.37E 2 / 5.00E 0	.78 :JA	.67 :JA	.69 :JA	.46 :JA	.69 :JA	.63 :JA	.94 :JA	5 :V#	1.8 :V	.52 :V	1.4 :V
CALCIUM	5000	0.00E 0 / 13573.30E 0	2060 :V	1190 :V	1620 :V	1780 :V	1540 :V	1560 :V	2090 :V	2430 :V	2280 :V	2120 :V	2160 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	12 :V	128 :V#	12.9 :V	9.8 :V	13.3 :V	12.4 :V	12.8 :V	39 :V#	50.2 :V#	10.6 :V	32.8 :V#
COBALT	50	0.00E 0 / 24.80E 0	5.7 :V	5.2 :V	4.9 :V	4.6 :V	5.2 :V	5.4 :V	5.4 :V	19.9 :V	6 :V	6.3 :V	6.8 :V
COPPER	25	1.10E 4 / 27.30E 0	25 :V	40.5 :V#	28.1 :V#		29.9 :V#	28.2 :V#		132 :V#	38 :V#		31 :V#
IRON	100	0.00E 0 / 28160.40E 0	11000 :V	10600 :V	11000 :V	9680 :V	11500 :V	12100 :V	11800 :V	16700 :V	12600 :V	9770 :V	18700 :V
LEAD	3	0.00E 0 / 61.40E 0	35 :V	35.1 :V	27 :V	25 :V	21.2 :V	24.8 :V	69.6 :V#	109 :V#	53.3 :V	32.6 :V	40.2 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	1880 :V	1810 :V	2080 :V	1830 :V	2230 :V	2300 :V	2010 :V	2300 :V	1490 :V	1430 :V	1690 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	294 :V	149 :V	253 :V	252 :V	240 :V	247 :V	318 :V	390 :V	347 :V	350 :V	356 :V
MERCURY	0.2	8.23E 1 / 0.20E 0								.13 :V	.057 :V		
NICKEL	40	5.49E 3 / 26.90E 0	7.5 :V	93.4 :V#	9.5 :V	7.2 :V	9.6 :V	9.1 :V	12 :V	81.5 :V#	48.3 :V#	6.9 :V	27.2 :V#
POTASSIUM	5000	0.00E 0 / 5256.80E 0	2410 :V	1910 :V	2240 :V	2040 :V	2270 :V	2360 :V	2350 :V	1960 :V	2050 :V	1990 :V	2240 :V
SILVER	10	1.37E 3 / 10.00E 0	.54 :V	.69 :V									.74 :V
SODIUM	5000	0.00E 0 / 1108.00E 0											
VANADIUM	50	1.92E 3 / 55.60E 0	22.9 :V	46.3 :V	21.4 :V	20.9 :V	21.8 :V	22.1 :V	48.7 :V	33.9 :V	24 :V	22.3 :V	24.5 :V
ZINC	20	8.23E 4 / 86.60E 0	80.1 I:JA	102 I:JA#	54 I:JA	44.5 I:JA	55.3 I:JA	56.6 I:JA	61.7 I:JA	282 :V#	103 :V#	37.2 :V	61.3 :V

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TABLE 3-4
Surface-Soil Positive Results
OU10 - IHSS 170

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Sample Location:			SS006493	SS006593	SS006693	SS006793	SS006893	SS006993	SS007093	SS007193	SS007293	SS007393	SS007493
Sample Identification Number:			SSG1063JE	SSG1064JE	SSG1065JE	SSG1066JE	SSG1067JE	SSG1068JE	SSG1069JE	SSG1070JE	SSG1071JE	SSG1072JE	SSG1073JE
Date Sampled:			6-Jan-94	12-Jan-94	10-Jan-94	4-Jan-94	4-Jan-94	10-Jan-94	11-Jan-94	10-Jan-94	10-Jan-94	11-Jan-94	11-Jan-94
Test Group:BNACLP Units:µg/kg	MDL	RBC / BKGND											
4-CHLORO-3-METHYLPHENOL	330	0.00E 0 / 0.00E 0											
ACENAPHTHENE	330	1.65E 7 / 0.00E 0		57 J:A									
ANTHRACENE	330	8.23E 7 / 0.00E 0		100 J:A		90 J:A							
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0		310 J:A		200 J:A			98 J:A				
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0	47 J:A	290 J:A*	50 J:A	210 J:A*		42 J:A	130 J:A*		78 J:A		
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0		860 :V		310 J:A		51 J:A	180 J:A		110 J:A		
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0							66 J:A-				
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0		240 J:A		110 J:A			68 J:A		41 J:A		
BENZOIC ACID	1600	1.10E 9 / 0.00E 0	110 J:A	99 J:A		190 J:V	64 J:A				160 J:A		
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0		72 J:A		86 J:A							
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0		37 J:A				38 J:A					
CHRYSENE	330	8.77E 4 / 0.00E 0	76 J:A	690 :V	53 J:A	370 J:A		43 J:A	130 J:A		88 J:A		
DI-n-BUTYL PHTHALATE	330	2.74E 7 / 0.00E 0											260 J:A
DI-n-OCTYL PHTHALATE	330	5.49E 6 / 0.00E 0											
FLUORANTHENE	330	1.10E 7 / 0.00E 0	100 J:A	1100 :V	110 J:A	560 :V		86 J:A	190 J:A		170 J:A		40 J:A
FLUORENE	330	1.10E 7 / 0.00E 0		41 J:A									
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0		93 J:A		92 J:A			95 J:A		56 J:A		
NAPHTHALENE	330	1.10E 7 / 0.00E 0											
PHENANTHRENE	330	0.00E 0 / 0.00E 0	48 J:A-	470 :V-	71 J:A-	270 J:A-		43 J:A-	98 J:A-		67 J:A-		
PYRENE	330	8.23E 6 / 0.00E 0	100 J:A	1100 :V	100 J:A	490 :V		82 J:A	190 J:A		150 J:A		39 J:A
Test Group:METADD Units:mg/kg													
LITHIUM	100	0.00E 0 / 20.00E 0	7.5 :V	4.7 :JA	8.3 :JA	8 I:JA	14.7 I:JA	12 :JA	7.8 :V	14.3 :JA	9.2 :JA	14.9 :V	13.4 :V
MOLYBDENUM	200	9.64E 0 / 40.00E 0											
STRONTIUM	200	1.65E 5 / 90.10E 0	14.5 :V	11.8 :JA	15.9 :JA	19.2 :V	17.1 :V	16.9 :JA	15.1 :V	21.5 :JA	18 :JA	15.8 :V	20.2 :V
TIN	200	0.00E 0 / 75.90E 0											
Test Group:PESTCLP Units:µg/kg													
4,4'-DDT	16	1.88E 3 / 0.00E 0		26 :V									
AROCLOR-1254	160	8.32E 1 / 0.00E 0											
HEPTACHLOR EPOXIDE	8	7.04E 1 / 0.00E 0		23 :V									
beta-BHC	8	3.56E 2 / 0.00E 0											
Test Group:SMETCLP Units:mg/kg													
ALUMINUM	200	0.00E 0 / 21915.40E 0	7950 :V	8310 :V	9120 :V	9900 :V	12700 :V	11000 :V	7460 :V	13200 :V	10400 :V	13100 :V	11800 :V
ARSENIC	10	3.66E-1 / 12.90E 0	4.4 :V*	3.5 :V*	5.7 :V*	8.4 :V*	2.5 :V*	2.6 :V*	2.3 :V*	3.7 :V*	5.7 :V*	2.7 :V*	3 :V*
BARIUM	200	1.92E 4 / 528.00E 0	74.2 :V	52.3 :V	104 :V	124 :V	108 :V	98.8 :V	70.8 :V	117 :V	120 :V	119 :V	110 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.41 :V	.35 :V	.48 :V	.64 :V	.59 :V	.67 :V	.55 :V	.77 :V	.6 :V	.63 :V	.76 :V
CADMIUM	5	1.37E 2 / 5.00E 0	.57 :JA	.82 :JA	1.5 :V	.92 :V	.36 :V	.49 :V		.58 :V	.61 :V		
CALCIUM	5000	0.00E 0 / 13573.30E 0	2120 :V	1500 :V	2850 :JA	2760 :V	9780 :V	9180 :JA	10200 :V	13700 :JA#	3300 :JA	9060 :V	13100 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	11.3 :V	16.5 :V	14.2 :V	13 :V	14.8 :JA	14.1 :JA	12.3 :V	17.4 :JA	14.1 :V	17 :V	15.3 :JA
COBALT	50	0.00E 0 / 24.80E 0	5.4 :V	3.3 :V	6.5 :V	6.1 :V	12.7 :V	12.1 :V	7.9 :V	14.4 :V	7.6 :V	13.1 :V	14.1 :V
COPPER	25	1.10E 4 / 27.30E 0		57.1 :V#			42 :V#	37.3 :V#	27 :V	37.9 :V#		39 :V#	51.1 :V#
IRON	100	0.00E 0 / 28160.40E 0	10900 :V	9130 :V	13200 :V	13400 :V	29900 :V#	27300 :V	19200 :V	34100 :V#	14900 :V	31900 :V#	33800 :V#
LEAD	3	0.00E 0 / 61.40E 0	27 :V	24 :V	29.6 :V	142 :V#	19.7 :V	28.1 :V	13.3 :V	14.8 :V	28.6 :V	13.2 :V	13.2 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	1940 :V	1270 :V	2410 :V	2000 :V	8520 :V#	7620 :V#	4720 :V	9690 :V#	3300 :V	8350 :V#	8850 :V#
MANGANESE	15	1.37E 3 / 2253.50E 0	252 :V	160 :V	352 :JA	353 :V	836 :V	705 :JA	438 :V	859 :JA	400 :JA	781 :V	820 :V
MERCURY	0.2	8.23E 1 / 0.20E 0											
NICKEL	40	5.49E 3 / 26.90E 0	7.7 :V	8 :V	8.7 :V	8.8 :V	10.7 :V	11.1 :V	7.4 :V	11.7 :V	11.1 :V	11.6 :V	10.3 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	2300 :V	1350 :V	2500 :V	2650 :V	4520 :V	4080 :V	2730 :V	5280 :V#	2950 :V	4890 :V	4720 :V
SILVER	10	1.37E 3 / 10.00E 0		64.9 :V#			.62 :V						
SODIUM	5000	0.00E 0 / 1108.00E 0			142 :V			200 :JA		215 :JA	135 :V		
VANADIUM	50	1.92E 3 / 55.60E 0	31.1 :V	13.8 :V	26.7 :V	28.3 :V	46 :V	45 :V	29.7 :V	55.9 :V#	30.1 :V	49.9 :V	49.7 :V
ZINC	20	8.23E 4 / 86.60E 0	101 I:JA#	147 :V#	52.4 :V	62.3 :V	109 :V#	95.8 :V#	86 I:JA	115 :V#	66.1 :V	110 I:JA#	114 I:JA#

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TABLE 3-4
Surface-Soil Positive Results
OU10 - IHSS 170

Sample Location:			SS007493	SS007593	SS007693	SS007793
Sample Identification Number:			SSG1130JE	SSG1074JE	SSG1075JE	SSG1076JE
Date Sampled:			11-Jan-94	12-Jan-94	11-Jan-94	11-Jan-94
Test Group:BNACLP Units:µg/kg	MDL	RBC / BKGND				
4-CHLORO-3-METHYLPHENOL	330	0.00E 0 / 0.00E 0				
ACENAPHTHENE	330	1.65E 7 / 0.00E 0				
ANTHRACENE	330	8.23E 7 / 0.00E 0				
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0		120 J:A		
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0				
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0				
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0				
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0				
BENZOIC ACID	1600	1.10E 9 / 0.00E 0		140 J:A		180 J:A
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0		750 :JA		
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0				
CHRYSENE	330	8.77E 4 / 0.00E 0				
DI-n-BUTYL PHTHALATE	330	2.74E 7 / 0.00E 0	89 J:A			
DI-n-OCTYL PHTHALATE	330	5.49E 6 / 0.00E 0				
FLUORANTHENE	330	1.10E 7 / 0.00E 0	36 J:A	170 J:A		
FLUORENE	330	1.10E 7 / 0.00E 0				
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0				
NAPHTHALENE	330	1.10E 7 / 0.00E 0				
PHENANTHRENE	330	0.00E 0 / 0.00E 0		160 J:A-		
PYRENE	330	8.23E 6 / 0.00E 0		330 J:A		
Test Group:METADD Units:mg/kg						
LITHIUM	100	0.00E 0 / 20.00E 0	13.8 :V	6.8 :JA	14.9 :V	12.4 :V
MOLYBDENUM	200	9.64E 0 / 40.00E 0				
STRONTIUM	200	1.65E 5 / 90.10E 0	20.5 :V	8.7 :JA	15.9 :V	14.3 :V
TIN	200	0.00E 0 / 75.90E 0				
Test Group:PESTCLP Units:µg/kg						
4,4'-DDT	16	1.88E 3 / 0.00E 0				
AROCLOR-1254	160	8.32E 1 / 0.00E 0				
HEPTACHLOR EPOXIDE	8	7.04E 1 / 0.00E 0				
beta-BHC	8	3.56E 2 / 0.00E 0				
Test Group:SMETCLP Units:mg/kg						
ALUMINUM	200	0.00E 0 / 21915.40E 0	12700 :V	5400 :V	13000 :V	12000 :V
ARSENIC	10	3.66E-1 / 12.90E 0	2.8 :V*	2.2 :V*	2.6 :V*	2.8 :V*
BARIUM	200	1.92E 4 / 528.00E 0	118 :V	51.3 :V	122 :V	115 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.77 :V	.36 :V	.59 :V	.51 :V
CADMIUM	5	1.37E 2 / 5.00E 0		3.5 :V		
CALCIUM	5000	0.00E 0 / 13573.30E 0	12700 :V	2180 :V	8940 :V	6960 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	15.7 :JA	9 :V	18.1 :V	15.8 :JA
COBALT	50	0.00E 0 / 24.80E 0	13.9 :V	4.6 :V	13.1 :V	10.8 :V
COPPER	25	1.10E 4 / 27.30E 0	38.3 :V#		54.5 :V#	38 :V#
IRON	100	0.00E 0 / 28160.40E 0	35800 :V#	10800 :V	32500 :V#	25900 :V
LEAD	3	0.00E 0 / 61.40E 0	12.7 :V	14.3 :V	11.6 :V	10.4 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	9630 :V#	2440 :V	8620 :V#	6490 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	866 :V	223 :V	761 :V	556 :V
MERCURY	0.2	8.23E 1 / 0.20E 0				
NICKEL	40	5.49E 3 / 26.90E 0	10.5 :V	7.2 :V	10.7 :V	9.8 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	4780 :V	1990 :V	5100 :V	4730 :V
SILVER	10	1.37E 3 / 10.00E 0		1 :V		
SODIUM	5000	0.00E 0 / 1108.00E 0				
VANADIUM	50	1.92E 3 / 55.60E 0	53.5 :V	18.2 :V	51.8 :V	42 :V
ZINC	20	8.23E 4 / 86.60E 0	120 I:JA#	174 :V#	109 I:JA#	138 I:JA#

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BKGND = Background concentration (DOE 1994c)
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
NA = Not Applicable
RBC = Risk-Based Concentration
V = Validation Qualifier: valid data
SQL = Sample Quantitation Limit
µg/g = microgram per gram
µg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
# = Indicates compound exceeds background
- = There is no RBC for that compound

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TABLE 3-5
Surface-Soil Positive Results Data Summary
OU10 - IHSS 170

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
Test Group:BNACLP Units:µg/kg												
4-CHLORO-3-METHYLPHENOL	330	340	SS005393 (4)	3300	SS005593 (1)	40 J:A	SS004493 (1)	83 J:A	SS005893 (1)	2	35	214.9429
ACENAPHTHENE	330	330	SS005893 (1)	3300	SS005593 (1)	52 J:A	SS004793 (1)	75 J:A	SS005193 (1)	3	35	211.4
ANTHRACENE	330	330	SS005893 (1)	3300	SS005593 (1)	41 J:A	SS006193 (1)	100 J:A	SS006593 (1)	6	35	204.3143
BENZO(a)ANTHRACENE	330	330	SS005893 (1)	3300	SS005593 (1)	46 J:A	SS004593 (1)	310 J:A	SS006593 (1)	13	35	208.6
BENZO(a)PYRENE	330	340	SS005693 (2)	410	SS004693 (1)	42 J:A	SS006993 (1)	290 J:A	SS006593 (1)	15	31	155.4194
BENZO(b)FLUORANTHENE	330	340	SS005693 (2)	410	SS004693 (1)	51 J:A	SS006993 (1)	860 :V	SS006593 (1)	13	31	223.6452
BENZO(ghi)PERYLENE	330	340	SS005693 (3)	410	SS004693 (1)	66 J:A	SS007093 (1)	77 J:A	SS005193 (1)	4	31	166.5806
BENZO(k)FLUORANTHENE	330	340	SS005693 (3)	410	SS004693 (1)	41 J:A	SS007293 (1)	240 J:A	SS006593 (1)	8	31	163.7742
BENZOIC ACID	1600	1600	SS005893 (1)	16000	SS005593 (1)	64 J:A	SS006893 (1)	190 J:V	SS006793 (1)	14	35	782.3714
BIS(2-ETHYLHEXYL)PHTHALATE	330	330	SS005893 (1)	380	SS007293 (1)	53 J:A	SS004793 (1)	4900 :J	SS005593 (1)	18	35	395.7143
BUTYL BENZYL PHTHALATE	330	330	SS005893 (1)	3300	SS005593 (1)	37 J:A	SS006593 (1)	69 J:A	SS005193 (1)	5	35	203.2286
CHRYSENE	330	330	SS005893 (1)	3300	SS005593 (1)	43 J:A	SS006993 (1)	690 :V	SS006593 (1)	19	35	225.8
DI-n-BUTYL PHTHALATE	330	330	SS005893 (1)	3300	SS005593 (1)	140 J:A	SS006393 (1)	260 J:A	SS007493 (1)	2	35	222.7143
DI-n-OCTYL PHTHALATE	330	340	SS005693 (3)	400	SS004593 (1)	62 J:A	SS004693 (1)	62 J:A	SS004693 (1)	1	31	175.871
FLUORANTHENE	330	340	SS005393 (3)	3300	SS005593 (1)	40 J:A	SS007493 (1)	1100 :V	SS006593 (1)	24	35	277.9429
FLUORENE	330	330	SS005893 (1)	3300	SS005593 (1)	41 J:A	SS006593 (1)	65 J:A	SS005193 (1)	3	35	210.4286
INDENO(1,2,3-cd)PYRENE	330	340	SS005693 (3)	410	SS004693 (1)	56 J:A	SS007293 (1)	130 J:A	SS005193 (1)	6	31	162.7097
NAPHTHALENE	330	330	SS005893 (1)	3300	SS005593 (1)	53 J:A	SS005193 (1)	53 J:A	SS005193 (1)	1	35	217.9429
PHENANTHRENE	330	330	SS005893 (1)	3300	SS005593 (1)	43 J:A	SS006993 (1)	470 :V	SS006593 (1)	20	35	210.4857
PYRENE	330	340	SS005393 (3)	3300	SS005593 (1)	39 J:A	SS007493 (1)	1100 :V	SS006593 (1)	24	35	285.6286
Test Group:METADD Units:mg/kg												
LITHIUM	100	**	**	**	**	3.8 :J	SS005193 (1)	14.9 :V	SS007393 (2)	35	35	8.3029
MOLYBDENUM	20	0.54	SS005493 (2)	4.6	SS007493 (1)	6.5 :V	SS005593 (1)	19.1 :V	SS006293 (1)	4	35	1.9169
STRONTIUM	200	**	**	**	**	8.2 :V	SS005593 (1)	21.5 :J	SS007193 (1)	35	35	14.9914
TIN	200	1.5	SS005793 (1)	6.7	SS006593 (1)	1.8 :V	SS004993 (1)	6.3 :V	SS006093 (1)	4	35	1.2714
Test Group:PESTCLP Units:µg/kg												
4,4'-DDT	16	16	SS005693 (2)	160	SS005593 (1)	26 :V	SS006593 (1)	26 :V	SS006593 (1)	1	35	11.2286
AROCLOR-1254	160	160	SS005693 (2)	1600	SS005593 (1)	180 :V	SS004993 (1)	330 :V	SS006193 (1)	2	35	117
HEPTACHLOR EPOXIDE	8	8	SS005893 (1)	9.8	SS004693 (1)	23 :V	SS006593 (1)	23 :V	SS006593 (1)	1	34	4.8691
beta-BHC	8	8	SS005893 (1)	9.8	SS004693 (1)	11 :V	SS004493 (1)	11 :V	SS004493 (1)	1	35	4.4986
Test Group:SMETCLP Units:mg/kg												
ALUMINUM	200	**	**	**	**	4660 :V	SS005193 (1)	13200 :V	SS007193 (1)	35	35	8475.714
ARSENIC	10	**	**	**	**	2.2 :V	SS007593 (1)	9 :V	SS004593 (1)	35	35	4.5543
BARIUM	200	**	**	**	**	46.2 :V	SS005193 (1)	124 :V	SS006793 (1)	35	35	89.24
BERYLLIUM	5	0.29	SS005093 (1)	0.5	SS004693 (1)	.25 :V	SS005593 (1)	.77 :V	SS007193 (2)	29	35	0.4396
CADMIUM	5	0.34	SS007393 (2)	0.37	SS007093 (1)	.36 :V	SS006893 (1)	12.3 :V	SS005193 (1)	30	35	1.2633
CALCIUM	5000	**	**	**	**	1190 :V	SS005593 (1)	13700 :J	SS007193 (1)	35	35	3949.714
CHROMIUM	10	**	**	**	**	8.6 :V	SS005093 (1)	128 :V	SS005593 (1)	35	35	18.3943
COBALT	50	**	**	**	**	3.2 :V	SS005193 (1)	19.9 :V	SS006093 (1)	35	35	7.2571
COPPER	25	12.3	SS005193 (1)	20.1	SS006693 (1)	18.3 :V	SS004393 (1)	132 :V	SS006093 (1)	23	35	27.4371
IRON	100	**	**	**	**	8990 :V	SS005193 (1)	35800 :V	SS007493 (1)	35	35	15639.14
LEAD	3	**	**	**	**	10.4 :V	SS007793 (1)	142 :V	SS006793 (1)	35	35	36.5743
MAGNESIUM	5000	**	**	**	**	1040 :V	SS005193 (1)	9690 :V	SS007193 (1)	35	35	3307.714
MANGANESE	15	**	**	**	**	138 :J	SS005193 (1)	866 :V	SS007493 (1)	35	35	377.4
MERCURY	0.2	0.05	SS005393 (4)	0.06	SS004593 (1)	.057 :V	SS006193 (1)	.13 :V	SS006093 (1)	2	35	0.03
NICKEL	40	**	**	**	**	5.5 :V	SS005093 (1)	93.4 :V	SS005593 (1)	35	35	14.94
POTASSIUM	5000	**	**	**	**	1070 :V	SS005193 (1)	5280 :V	SS007193 (1)	35	35	2690.572
SILVER	10	0.39	SS005793 (2)	2.7	SS007493 (1)	.44 :V	SS005293 (1)	64.9 :V	SS006593 (1)	8	35	2.39
SODIUM	5000	75.6	SS006593 (1)	237	SS006093 (1)	135 :V	SS007293 (1)	215 :J	SS007193 (1)	5	35	93.3129
VANADIUM	50	**	**	**	**	13 :V	SS005093 (1)	55.9 :V	SS007193 (1)	35	35	29.7886
ZINC	20	**	**	**	**	37.2 :V	SS006293 (1)	282 :V	SS006093 (1)	35	35	89.0714
Test Group:WQPL Units:µg/g												

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
G = Native analyte greater than four times spike added - inorganics
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
SQL = Sample Quantitation Limit

V = Validation Qualifier: valid data
µg/g = microgram per gram
µg/kg = microgram per kilogram
* = The number of sample locations at that value is shown in parentheses
** = All samples reported with positive results; no nondetects reported

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Plate 3 presents five concentration plots of analytes detected in IHSS 170 surface-soil: metals (above background), carcinogenic PAHs, noncarcinogenic PAHs, benzo(a)pyrene and PCBs (Aroclor-1254 and -1260), and other organic analytes. As can be seen on Plate 3, PAHs were detected at nearly every sample location. Benzo(a)pyrene, which was the only PAH that exceeded the RBC, was found at elevated levels southeast of the stained area, where the stainless-steel cuttings pile existed, and at three central locations along the northern boundary. The 15 of 31 samples with detectable levels of benzo(a)pyrene were reported as estimated values ("J" qualifier).

Lower levels of PAHs were found throughout the site and at the two offsite sample locations (Plate 3). In addition to benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, pyrene, and phenanthrene were frequently detected. Although most of the values were reported as estimated concentrations, the phthalate and benzoic acid levels, detected at locations throughout the site, were well below their respective reference RBCs and were mostly reported as estimated concentrations. As noted above, only one organic compound other than benzo(a)pyrene exceeded the risk-based level. This compound is Aroclor-1254, which was detected at locations SS004993 and SS006193 southeast of the stained area.

Twelve inorganics exceeded background at a minimum of one sample location: cadmium, calcium, chromium, copper, iron, lead, magnesium, nickel, potassium, silver, vanadium, and zinc (Plate 3). None of the inorganics exceeded available RBCs.

3.3.3 Soil-Gas Survey

The soil-gas survey was conducted on a 40-foot grid with the exception of one area with more densely spaced sample points because of surface-soil staining. Two-hundred-eleven soil-gas locations were sampled. Figure 3-3 presents the soil-gas sampling locations. Concentrations of target VOCs equal to or exceeding the target detection limit of 1.0 μg/L are listed in Table 3-6 and are illustrated on Plate 4.

In the southeastern corner of IHSS 170, five locations outside the eastern border of the IHSS and one location inside the eastern border exhibited concentrations of 1,1,1-TCA above target detection limits. The maximum concentration of 1,1,1-TCA in this area is 39.00 μg/L at sample location number SG029994. The minimum concentration of 1,1,1-TCA is 2.80 μg/L at location number SG027494. Three locations outside the boundary and one location inside the boundary exhibited concentrations of PCE. A maximum concentration 4.7 μg/L was observed at site SG029994. A minimum concentration of 1.19 μg/L of PCE was present at site SG025094. Acetone was observed at location SG027594 at a concentration of 1.90 μg/L.

In the northeastern corner outside the boundary of IHSS 170, 1,1,1-TCA was present at levels above the target detection limit at two locations. The maximum concentration of 1,1,1-TCA is present in amounts of 41.71 μg/L at location SG038294. Concentrations of 2.87 μg/L of benzene, 1.49 μg/L of TCE, 1.20 μg/L of PCE, and 5.54 μg/L of acetone were also observed in this sample. PCE was also present in a concentration of 1.0 μg/L at location SG038394.

Another area in the center of IHSS 170 was observed to have concentrations exceeding the target detection limit of 1.0 μg/kg. The density of soil-gas points in this area is greater than the 40-foot grid in the rest of IHSS 170. The greater density of soil-gas points is the result of staining noted in the surface-soil. Only one location exhibited any concentrations of compounds above target detection limits. This sample, collected at location SG050294, contained 1,1,1-TCA in a concentration of 1.84 μg/L.

Methane is present at 29 locations in IHSS 170 in concentrations ranging from 10.0 ppm at seven sample sites to 220 ppm at one sample site. The location of these low level concentrations appear to be mainly around the perimeter of IHSS 170 (Plate 4).

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TABLE 3-6
Target Analytes for OU10 - IHSS 170 Soil-Gas Environmental Samples
(Concentrations Above Detection Levels for 14 Chemicals of Concern [1])

LOCATION NUMBER	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	TARGET ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG022894	SGG0228JE	5/31/94	Real	Methane	40.00	ppm		20.00
SG025094	SGG0250JE	6/3/94	Real	1,1,1-Trichloroethane	6.60	µg/L	J	0.03
				Tetrachloroethene	1.19	µg/L		0.02
SG027394	SGG0273JE	4/25/94	Real	1,1,1-Trichloroethane	12.13	µg/L	J	0.03
				Tetrachloroethene	2.44	µg/L	J	0.02
	SGG0953JE	6/6/94	Dilu	1,1,1-Trichloroethane	* 4.52	µg/L		0.61
				Tetrachloroethene	* 1.51	µg/L		0.41
SG027494	SGG0274JE	6/3/94	Real	1,1,1-Trichloroethane	2.80	µg/L	J	0.03
				Methane	80.00	ppm		20.00
SG027594	SGG0455JE	8/17/94	Real	Acetone	1.90	µg/L		1.43
				1,1,1-Trichloroethane	11.00	µg/L		1.43
				Tetrachloroethene	2.40	µg/L		1.43
				Methane	200.00	ppm		20.00
SG027694	SGG0276JE	6/2/94	Real	Methane	10.00	ppm		20.00
SG028994	SGG0289JE	6/6/94	Real	Methane	10.00	ppm		20.00
SG029894	SGG0298JE	6/3/94	Real	1,1,1-Trichloroethane	3.50	µg/L	J	0.03
				Methane	20.00	ppm		20.00
SG029994	SGG0299JE	8/9/94	Real	1,1,1-Trichloroethane	*39.00	µg/L		0.03
				Tetrachloroethene	1.50	µg/L	B	0.12
	SGG0456JE	8/17/94	Real	1,1,1-Trichloroethane	30.00	µg/L		2.86
				Tetrachloroethene	4.70	µg/L		2.86
				Methane	220.00	ppm		20.00
SG032294	SGG0322JE	6/3/94	Real	Methane	10.00	ppm		20.00
SG032394	SGG0323JE	6/2/94	Real	Methane	20.00	ppm		20.00
SG032794	SGG0327JE	6/6/94	Real	Methane	30.00	ppm		20.00
SG034694	SGG0346JE	6/3/94	Real	Methane	20.00	ppm		20.00
SG036594	SGG0365JE	5/20/94	Real	Acetone	1.04	µg/L		0.03
SG036994	SGG0369JE	6/2/94	Real	Methane	20.00	ppm		20.00
SG038194	SGG0950JE	6/6/94	Dilu	1,1,1-Trichloroethane	32.61	µg/L		0.49

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TABLE 3-6
Target Analytes for OU10 - IHSS 170 Soil-Gas Environmental Samples
(Concentrations Above Detection Levels for 14 Chemicals of Concern [1])

LOCATION NUMBER	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	TARGET ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
				Methane	50.00	ppm		20.00
SG038294	SGG0382JE	5/31/94	Real	1,1,1-Trichloroethane	55.00	µg/L	J	0.03
				Trichloroethene	5.50	µg/L	J	0.03
				Tetrachloroethene	* 1.2	µg/L		0.02
				Methane	50.00	ppm		20.00
	SGG0951JE	6/6/94	Dilu	Acetone	5.54	µg/L		2.68
			Dilu	1,1,1-Trichloroethane	* 41.71	µg/L		2.68
			Dilu	Benzene	2.87	µg/L		2.68
			2nd	1,1,1-Trichloroethane	48.42	µg/L	J	0.66
			2nd	Trichloroethene	* 1.49	µg/L		0.66
			2nd	Tetrachloroethene	1.00	µg/L		0.44
			Dilu	Methane	20.00	ppm		20.00
			2nd	Methane	20.00	ppm		20.00
SG038394	SGG0383JE	5/31/94	Real	Tetrachloroethene	1.00	µg/L		0.02
				Methane	20.00	ppm		20.00
SG038494	SGG0384JE	5/31/94	Real	Methane	20.00	ppm		20.00
SG038594	SGG0385JE	5/31/94	Real	Methane	10.00	ppm		20.00
SG038694	SGG0386JE	5/31/94	Real	Methane	20.00	ppm		20.00
SG038994	SGG0389JE	6/1/94	Real	Methane	10.00	ppm		20.00
SG039094	SGG0390JE	6/1/94	Real	Methane	10.00	ppm		20.00
SG039194	SGG0391JE	6/1/94	Real	Methane	30.00	ppm		20.00
SG039594	SGG0395JE	6/1/94	Real	Methane	40.00	ppm		20.00
SG039694	SGG0396JE	6/1/94	Real	Methane	20.00	ppm		20.00
SG040094	SGG0400JE	6/1/94	Real	Methane	50.00	ppm		20.00
SG040194	SGG0401JE	6/2/94	Real	Methane	20.00	ppm		20.00
SG040494	SGG0404JE	6/2/94	Real	Methane	10.00	ppm		20.00
SG040594	SGG0405JE	6/2/94	Real	Methane	50.00	ppm		20.00

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TABLE 3-6

Target Analytes for OU10 - IHSS 170 Soil-Gas Environmental Samples
(Concentrations Above Detection Levels for 14 Chemicals of Concern [1])

LOCATION NUMBER	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	TARGET ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG040694	SGG0406JE	6/2/94	Real	Methane	20.00	ppm		20.00
SG050294	SGG0502JE	5/20/94	Real	1,1,1-Trichloroethane	5.34	µg/L	J	0.03
	SGG0954JE	8/9/94	Real	1,1,1-Trichloroethane	*1.84	µg/L		0.10

Notes:

1) The target detection level of 1.0 µg/L applies to the following chemicals of concern: 1,1,1-trichloroethane, 2-butanone, acetone, benzene, carbon tetrachloride, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, cis-1,2-dichloroethene, and xylenes.
The field instrument detection level for hydrogen sulfide is 5 ppm.
The field instrument detection level for methane is 20 ppm.
Report values of 10 ppm are estimated (see Section 3.1.3).

2) J = estimated quantity
B = analyte found in blank

ppm = parts per million
• = most reliable data.
Real = environmental sample
Dilu = Dilution
2nd = Second dilution
µg/L = micrograms per liter

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Methane concentrations existing in the orders of magnitude exhibited in IHSS 170 are considered very low level. Typical composition of land-fill gas at OU7 is 45 to 70 percent methane or 450,000 ppm to 700,000 ppm (DOE 1994d). The presence of minor concentrations of methane in IHSS 170 can probably be attributed to naturally occurring organic decay.

3.4 IHSS 174A - DRUM STORAGE AREA - AND IHSS 174B - DUMPSTER STORAGE AREA

The PUD Container Storage Yard (IHSS 170) contains the Drum Storage Area and the Dumpster Storage Area, designated at IHSSs 174A and IHSS 174B, respectively. IHSS 174A is a 60-foot by 60-foot (approximately) square area in the northeast corner of the site. IHSS 174B is a smaller area along the northern fenceline, approximately 300 feet east of the western fenceline of IHSS 170. There is no documentation of spills at either IHSS.

IHSS 174A was used from 1974 or 1976 until 1985 for the storage of drums containing waste oils or waste paints and paint thinner. Storage capacity of the area has been estimated at 460 drums, although the maximum number of drums stored at any one time may have been considerably less (Rockwell et al. 1988). No secondary containment existed. In August 1985, all of the stored drums were removed for disposal. Administrative controls have existed that prevented radioactively contaminated material from being shipped to the PUD Container Storage Yard.

IHSS 174B was used from 1974 to 1985 for dumpster storage of stainless-steel machining chips coated with lathe coolant before offsite recycling. The coolants that were used were either freon-based or composed of a hydraulic oil/carbon tetrachloride mixture. The dumpster was located directly on the ground surface and did not have any secondary containment. Visible staining was caused by spills during transfer and from rainwater washing residuals onto the ground.

Several investigations have been conducted at the two IHSSs. A 1985 sampling effort of the drummed material determined that the waste contained paraffinic-based mineral oil, a volatile hydrocarbon solvent (e.g., mineral spirits such as aliphatic naphtha), carbon dioxide, methyl alcohol, silicone lubricant, freon, freon TF, water, and xylenes. Inorganics detected include aluminum, barium, beryllium, calcium, chromium, copper, iron, potassium, lithium, magnesium, molybdenum, sodium, nickel, lead, silicon, and zinc (Rockwell et al. 1988).

An initial soil characterization program for the two IHSSs, conducted in 1988, indicated the presence of several organics including acetone, 4-chloro-3-methylphenol, PCE, 1,1,1-TCA, and bis(2-ethylhexyl)phthalate. A number of inorganics were also detected including aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, magnesium, sodium, nickel, lead, iron, manganese, zinc, vanadium, potassium, and nitrates. Radionuclides detected include gross alpha, gross beta, tritium, americium-241, uranium-233, -234, and -238, and plutonium-239 and -240 (DOE 1992a). Acetone, methylene chloride, and nitrate/nitrite were also detected in groundwater downgradient of the site.

3.4.1 High Purity Germanium Survey

IHSSs 174A and 174B are within IHSS 170. The HPGe discussion for IHSS 170 also includes information about IHSSs 174A and 174B. HPGe locations for the general area of IHSS 170, IHSS 174A, and IHSS 174B are illustrated on Plate 1, the Americium Specific Activity Map.

3.4.2 Surface-Soil Sampling

Complete analytical results for surface-soil samples collected at IHSS 174A are included in Appendix B. Table 3-7 identifies the detected analytes by sample location; summary information is provided in Table 3-8. Twenty-six samples, including one duplicate sample, were collected at IHSS 174A. Figures 3-4 and 3-5 show surface-soil sample locations for IHSSs 174A and

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TABLE 3-7
Surface-Soil Positive Results
OU10 - IHSS 174A

Sample Location:			SS001093	SS001193	SS001293	SS001393	SS001493	SS001593	SS001693	SS001793	SS001893	SS001893	SS001993
Sample Identification Number:			SSG1077JE	SSG1078JE	SSG1079JE	SSG1080JE	SSG1081JE	SSG1082JE	SSG1083JE	SSG1084JE	SSG1085JE	SSG1116JE	SSG1086JE
Date Sampled:			22-Dec-93	22-Dec-93	27-Dec-93	27-Dec-93	27-Dec-93	20-Dec-93	21-Dec-93	21-Dec-93	21-Dec-93	21-Dec-93	21-Dec-93
Test Group:BNACLP Units: µg/kg	MDL	RBC / BKGND											
ACENAPHTHENE	330	1.65E 7 / 0.00E 0				38 J:A	55 J:A						
ANTHRACENE	330	8.23E 7 / 0.00E 0			43 J:A	49 J:A	77 J:A						
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0				160 J:A	230 J:A	110 J:A					
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0				180 J:A*	260 J:A*	140 J:A*	61 J:A	63 J:A			
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0				260 J:A	340 J:A	180 J:A	94 J:A	150 J:A		370 J:A	
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0				120 J:A-	170 J:A-	100 J:A-	42 J:A-				
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0				82 J:A	130 J:A	81 J:A					
BENZOIC ACID	1600	1.10E 9 / 0.00E 0			530 J:A	62 J:A							
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0	2800 :JA	2300 :JA	100 J:A	56 J:A	66 J:A	110 J:A	75 J:A		1500 :V	1500 :V	3200 :JA
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0			110 J:A	70 J:A	82 J:A		39 J:A				
CHRYSENE	330	8.77E 4 / 0.00E 0			190 J:A	210 J:A	270 J:A	150 J:A	74 J:A	82 J:A		210 J:A	
FLUORANTHENE	330	1.10E 7 / 0.00E 0	170 J:A	660 J:A	190 J:A	400 :V	510 :V	280 J:A	140 J:A	140 J:A	170 J:A	290 J:A	
FLUORENE	330	1.10E 7 / 0.00E 0					40 J:A						
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0				130 J:A	170 J:A	100 J:A	44 J:A				
PENTACHLOROPHENOL	1600	5.34E 3 / 0.00E 0			39 J:A								
PHENANTHRENE	330	0.00E 0 / 0.00E 0		600 J:A-	180 J:A-	260 J:A-	340 J:A-	150 J:A-	73 J:A-	70 J:A-		240 J:A-	
PYRENE	330	8.23E 6 / 0.00E 0	390 J:A	1700 :JA	610 :JA	360 J:A	500 :V	270 J:A	100 J:A	170 J:A	330 J:A	490 J:A	540 J:A
Test Group:METADD Units: mg/kg													
LITHIUM	100	0.00E 0 / 20.00E 0	3.7 :JA	5.1 :JA	4.6 :JA	4.7 :JA	3.8 :JA	4.7 :JA	6 :JA	5.3 :JA	3.5 :JA	3.9 :JA	3.6 :JA
MOLYBDENUM	200	9.64E 0 / 40.00E 0						.95 :V					
STRONTIUM	200	1.65E 5 / 90.10E 0	9.8 :JA	10.3 :JA	9 :JA	8.8 :JA	9.7 :JA	9.2 :JA	13.1 :JA	12.7 :JA	9 :JA	9.4 :JA	10.1 :JA
TIN	200	0.00E 0 / 75.90E 0	3.6 :JA			2 :JA					3 :JA	3 :JA	3.5 :JA
Test Group:PESTCLP Units: µg/kg													
AROCLOR-1254	160	8.32E 1 / 0.00E 0			3400 :V*			920 :V*			2500 :V*	2600 :V*	9000 :V*
beta-BHC	8	3.56E 2 / 0.00E 0									11 :V	12 :JA	20 :V
delta-BHC	8	0.00E 0 / 0.00E 0											10 :V-
Test Group:SMETCLP Units: mg/kg													
ALUMINUM	200	0.00E 0 / 21915.40E 0	5140 :V	5180 :V	4510 :V	4300 :V	4240 :V	4530 :V	4940 :V	4970 :V	4280 :V	4520 :V	4530 :V
ARSENIC	10	3.66E-1 / 12.90E 0	3.5 :V*	2.7 :V*	2.1 :V*	2 :V*	3 :V*	2.1 :V*	2.4 :V*	2.9 :V*	2.7 :V*	3 :V*	2.8 :V*
BARIUM	200	1.92E 4 / 528.00E 0	56.7 :V	52 :V	56.9 :V	44.9 :V	52.8 :V	56.7 :V	60.1 :V	63.2 :V	62.9 :V	62.2 :V	87.9 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	35.1 :V*#	3.1 :V*						.46 :V	5 :V*	4.9 :V*	10.7 :V*#
CADMIUM	5	1.37E 2 / 5.00E 0				.44 :V	.5 :V	.49 :JA	.85 :V	.4 :V			
CALCIUM	5000	0.00E 0 / 13573.30E 0	1440 :V	1470 :V	1410 :V	1420 :V	1430 :V	1430 I:JA	1570 :V	1610 :V	1220 :V	1250 :V	1410 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	11.1 :V	8.5 :V	12.6 :V	6.8 :V	7.5 :V	7.6 :V	9.3 :V	8.5 :V	34.7 :V#	43.5 :V#	42 :V#
COBALT	50	0.00E 0 / 24.80E 0	3.8 :V	3.6 :V	3.5 :V	3.3 :V	3.2 :V	3.4 :V	4.4 :V	4 :V	3.3 :V	3.6 :V	3.2 :V
COPPER	25	1.10E 4 / 27.30E 0	108 :V#	15.3 :JA	14.2 :JA	13.2 :JA	10.3 :JA		21.6 :V	14 :JA	30.9 :V#	29.2 :V#	40.3 :V#
IRON	100	0.00E 0 / 28160.40E 0	6840 :V	8820 :V	8240 :V	8050 :V	6940 :V	7910 :V	8730 :V	8190 :V	7330 :V	7400 :V	7320 :V
LEAD	3	0.00E 0 / 61.40E 0	27.5 :V	21.7 :V	22.9 :V	23.4 :V	21 :V	22.1 :V	39.8 :V	53.4 :V	93.4 :V#	101 :V#	75.7 :V#
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	1220 :V	1710 :V	1660 :V	1540 :V	1320 :V	1540 :V	1810 :V	1710 :V	1090 :V	1110 :V	1270 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	128 :V	131 :V	145 :V	151 :V	150 :V	190 :JA	200 :V	185 :V	108 :V	114 :V	106 :V
MERCURY	0.2	8.23E 1 / 0.20E 0											.19 :V
NICKEL	40	5.49E 3 / 26.90E 0	9.8 :V	6.1 :V	4.6 :V	5 :V	13.9 :V	6.1 :V	6 :V	5.9 :V	38.2 :V#	53.4 :V#	52.8 :V#
POTASSIUM	5000	0.00E 0 / 5256.80E 0	1210 :V	1730 :V	1720 :V	1520 :V	1270 :V	1570 :V	1990 :V	1890 :V	1170 :V	1230 :V	1260 :V
SELENIUM	5	1.37E 3 / 1.40E 0	20.4 :V#	1.4 :V#		.63 :V					2.2 :V#	2.3 :V#	5.5 :V#
SILVER	10	1.37E 3 / 10.00E 0						.65 :V	.47 :V				
SODIUM	5000	0.00E 0 / 1108.00E 0						189 :V					
THALLIUM	10	0.00E 0 / 2.00E 0	5.4 :V#										
VANADIUM	50	1.92E 3 / 55.60E 0	43400 :V*#	3080 :V*#	26 :V	15.5 :V	15.1 :V	21.4 :V	19.8 :V	140 :V#	5300 :V*#	5110 :V*#	11300 :V*#
ZINC	20	8.23E 4 / 86.60E 0	44.8 :V	39.8 :V	48.6 :V	65.6 :V	48.9 :V	44.9 :V	104 :V#	46.7 :V	64.9 :V	62.9 :V	59.6 :V

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TABLE 3-7
Surface-Soil Positive Results
OU10 - IHSS 174A

Sample Location:			SS002093	SS002193	SS002293	SS002393	SS002493	SS002593	SS002693	SS002793	SS002893	SS002993	SS003093
Sample Identification Number:			SSG1087JE	SSG1088JE	SSG1089JE	SSG1090JE	SSG1091JE	SSG1092JE	SSG1093JE	SSG1094JE	SSG1095JE	SSG1096JE	SSG1097JE
Date Sampled:			16-Dec-93	16-Dec-93	16-Dec-93	20-Dec-93	20-Dec-93	14-Dec-93	14-Dec-93	15-Dec-93	15-Dec-93	15-Dec-93	10-Dec-93
Test Group:BNACLP Units: µg/kg	MDL	RBC / BKGND											
ACENAPHTHENE	330	1.65E 7 / 0.00E 0				42 J:A							
ANTHRACENE	330	8.23E 7 / 0.00E 0					43 J:A						
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0	74 J:A		39 J:A	120 J:A	160 J:A		54 J:A	44 J:A			
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0			47 J:A	130 J:A*	160 J:A*	65 J:A					
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0			75 J:A	150 J:A	220 J:A	98 J:A	85 J:A		110 J:A		
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0				92 J:A-	100 J:A-						
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0				63 J:V		41 J:A	38 J:A				
BENZOIC ACID	1600	1.10E 9 / 0.00E 0											
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0	350 J:A		41 J:A	100 J:A	150 J:A	110 J:A	120 J:A	120 J:A	230 J:A	360 :V	
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0			150 J:A		230 J:A		170 J:A	1400 :V	300 J:A		
CHRYSENE	330	8.77E 4 / 0.00E 0	95 J:A			140 J:A	190 J:A		75 J:A				
FLUORANTHENE	330	1.10E 7 / 0.00E 0	200 J:A		110 J:A	290 J:A	380 :V	160 J:A	150 J:A	120 J:A	95 J:A	100 J:A	80 J:A
FLUORENE	330	1.10E 7 / 0.00E 0											
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0											
PENTACHLOROPHENOL	1600	5.34E 3 / 0.00E 0											
PHENANTHRENE	330	0.00E 0 / 0.00E 0	110 J:A-		65 J:A-	230 J:A-	220 J:A-	86 J:A-		61 J:A-			
PYRENE	330	8.23E 6 / 0.00E 0	190 J:A	340 J:A	89 J:A	250 J:V	360 :A	140 J:A	140 J:A	110 J:A	200 J:A	120 J:A	67 J:A
Test Group:METADD Units: mg/kg													
LITHIUM	100	0.00E 0 / 20.00E 0	6.5 :V	5.7 :V	5.2 :V	5.1 :JA	5.6 :JA	6.1 :V	5.7 :V	5.2 :V	5.4 :V	5.5 :V	5.9 :V
MOLYBDENUM	200	9.64E 0 / 40.00E 0				1.1 :V	.86 :V						
STRONTIUM	200	1.65E 5 / 90.10E 0	12.9 :V	9.6 :V	7.8 :V	10.5 :JA	9.7 :JA	17.3 :V	9.9 :V	14.1 :V	9.1 :V	10.5 :V	10.4 :V
TIN	200	0.00E 0 / 75.90E 0											
Test Group:PESTCLP Units: µg/kg													
AROCLOR-1254	160	8.32E 1 / 0.00E 0											
beta-BHC	8	3.56E 2 / 0.00E 0											
delta-BHC	8	0.00E 0 / 0.00E 0											
Test Group:SMETCLP Units: mg/kg													
ALUMINUM	200	0.00E 0 / 21915.40E 0	7500 :V	5670 :V	4390 :V	4400 :V	4830 :V	6730 :V	4970 :V	4710 :V	4770 :V	5610 :V	5440 :V
ARSENIC	10	3.66E-1 / 12.90E 0	5 :V*	3.1 :JA*	2.1 :JA*	2.1 :V*	2.3 :V*	5.4 :V*	3.2 :JA*	2 :JA*	1.8 :JA*	6.5 :V*	4 :JA*
BARIUM	200	1.92E 4 / 528.00E 0	79.9 :V	63.7 :V	52.7 :V	53.3 :V	54.7 :V	92.4 :V	66.1 :V	57.9 :V	52.8 :V	62.5 :V	62.5 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.59 :V	.66 :V	.14 :V			.34 :V	.27 :V	.28 :V	.2 :V	.28 :V	.39 :V
CADMIUM	5	1.37E 2 / 5.00E 0				.69 :JA	.47 :JA	.64 :JA	.63 :JA				
CALCIUM	5000	0.00E 0 / 13573.30E 0	1790 :V	1410 :V	1360 :V	1420 I:JA	1480 I:JA	2050 :V	1650 :V	3220 :V	1560 :V	1540 :V	1660 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	13.1 :V	10.5 :V	7.2 :V	7 :V	8.2 :V	8.9 :V	7.7 :V	7.7 :V	10.8 :V	9.5 :V	9 :V
COBALT	50	0.00E 0 / 24.80E 0	5.3 :V	4.4 :V	3.7 :V	3.8 :V	4.2 :V	4.3 :V	3.8 :V	3.7 :V	3.8 :V	4.3 :V	4.3 :V
COPPER	25	1.10E 4 / 27.30E 0		57.4 :JA#									
IRON	100	0.00E 0 / 28160.40E 0	9790 :V	9680 :V	8070 :V	8570 :V	9150 :V	9590 :V	9380 :V	8200 :V	8500 :V	8700 :V	9400 :V
LEAD	3	0.00E 0 / 61.40E 0	35.1 :V	814 :V#	18.9 :V	20.4 :V	22.4 :V	44.1 :V	314 :V#	149 :V#	32 :V	35.1 :V	26.4 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	1580 :V	1730 :V	1780 :V	1780 :V	1870 :V	1720 :V	1890 :V	2120 :V	1880 :V	1720 :V	1920 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	228 :V	204 :V	201 :V	179 :JA	188 :JA	249 :V	278 :V	199 :V	178 :V	204 :V	208 :V
MERCURY	0.2	8.23E 1 / 0.20E 0											
NICKEL	40	5.49E 3 / 26.90E 0	12.5 :V	8.5 :V	4.7 :V	5.6 :V	7.8 :V	7.1 :V	6.1 :V	5.3 :V	9.7 :V	6.5 :V	7.5 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	1850 :V	1810 :V	1870 :V	1840 :V	1930 :V	1940 :V	2000 :V	1950 :V	1920 :V	1880 :V	1990 :V
SELENIUM	5	1.37E 3 / 1.40E 0											
SILVER	10	1.37E 3 / 10.00E 0				.63 :V	.48 :V						
SODIUM	5000	0.00E 0 / 1108.00E 0	136 :V	84.1 :V	146 :V	183 :V	144 :V	71.6 :V	133 :V	186 :V	160 :V	149 :V	129 :V
THALLIUM	10	0.00E 0 / 2.00E 0											
VANADIUM	50	1.92E 3 / 55.60E 0	1500 :V#	2210 :V*#	19.2 :V	22.4 :V	19 :V	23.5 :V	22.8 :V	49.9 :V	365 :V#	194 :V#	52.9 :V
ZINC	20	8.23E 4 / 86.60E 0	51.2 I:JA	53.6 I:JA	57.4 I:JA	91.5 :V#	60.9 :V	57.2 I:JA	55.3 I:JA	48 I:JA	52.6 I:JA	58 I:JA	47.4 I:JA

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TABLE 3-7
Surface-Soil Positive Results
OU10 - IHSS 174A

Sample Location:			SS003193	SS003293	SS003393	SS003493
Sample Identification Number:			SSG1098JE	SSG1099JE	SSG1100JE	SSG1101JE
Date Sampled:			10-Dec-93	10-Dec-93	14-Dec-93	14-Dec-93
Test Group:BNACLP Units: µg/kg	MDL	RBC / BKGND				
ACENAPHTHENE	330	1.65E 7 / 0.00E 0				
ANTHRACENE	330	8.23E 7 / 0.00E 0				
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0		40 J:A		89 J:A
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0				79 J:A
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0		68 J:A		110 J:A
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0		37 J:A-		
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0		36 J:A		
BENZOIC ACID	1600	1.10E 9 / 0.00E 0				
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0		90 J:A	50 J:A	72 J:A
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0			350 J:A	
CHRYSENE	330	8.77E 4 / 0.00E 0				100 J:A
FLUORANTHENE	330	1.10E 7 / 0.00E 0	78 J:A	120 J:A	110 J:A	250 J:A
FLUORENE	330	1.10E 7 / 0.00E 0				
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0				
PENTACHLOROPHENOL	1600	5.34E 3 / 0.00E 0				
PHENANTHRENE	330	0.00E 0 / 0.00E 0		68 J:A-		150 J:A-
PYRENE	330	8.23E 6 / 0.00E 0	79 J:A	100 J:A	91 J:A	180 J:A
Test Group:METADD Units: mg/kg						
LITHIUM	100	0.00E 0 / 20.00E 0	5.5 :V	6.2 :V	6.4 :V	6.2 :V
MOLYBDENUM	200	9.64E 0 / 40.00E 0				
STRONTIUM	200	1.65E 5 / 90.10E 0	9 :V	12.3 :V	14.5 :V	10.3 :V
TIN	200	0.00E 0 / 75.90E 0				
Test Group:PESTCLP Units: µg/kg						
AROCLOR-1254	160	8.32E 1 / 0.00E 0				
beta-BHC	8	3.56E 2 / 0.00E 0				
delta-BHC	8	0.00E 0 / 0.00E 0				
Test Group:SMETCLP Units: mg/kg						
ALUMINUM	200	0.00E 0 / 21915.40E 0	4800 :V	6200 :V	6310 :V	5590 :V
ARSENIC	10	3.66E-1 / 12.90E 0	2.2 :JA*	3.5 :JA*	3.5 :JA*	2.9 :JA*
BARIUM	200	1.92E 4 / 528.00E 0	58.6 :V	68.6 :V	72 :V	65.1 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.26 :V	.26 :V	.25 :V	.24 :V
CADMIUM	5	1.37E 2 / 5.00E 0			.4 :JA	
CALCIUM	5000	0.00E 0 / 13573.30E 0	1580 :V	1910 :V	1850 :V	1740 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	9.8 :V	8.8 :V	8.8 :V	8.5 :V
COBALT	50	0.00E 0 / 24.80E 0	4 :V	4.5 :V	4.8 :V	4.4 :V
COPPER	25	1.10E 4 / 27.30E 0				
IRON	100	0.00E 0 / 28160.40E 0	8700 :V	9500 :V	9680 :V	9530 :V
LEAD	3	0.00E 0 / 61.40E 0	24.1 :V	36.1 :V	25.4 :V	22.1 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	1930 :V	1960 :V	1910 :V	2040 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	247 :V	213 :V	221 :V	217 :V
MERCURY	0.2	8.23E 1 / 0.20E 0				
NICKEL	40	5.49E 3 / 26.90E 0	10.1 :V	6.5 :V	5.8 :V	5.6 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	2020 :V	2180 :V	2180 :V	2240 :V
SELENIUM	5	1.37E 3 / 1.40E 0				
SILVER	10	1.37E 3 / 10.00E 0				
SODIUM	5000	0.00E 0 / 1108.00E 0	65.8 :V	147 :V	151 :V	153 :V
THALLIUM	10	0.00E 0 / 2.00E 0				
VANADIUM	50	1.92E 3 / 55.60E 0	185 :V#	36 :V	22.8 :V	16 :V
ZINC	20	8.23E 4 / 86.60E 0	43.7 I:JA	47.6 I:JA	50.6 I:JA	47.1 I:JA

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BHC = Benzene hexachloride
BKGND = Background concentration (DOE 1994c)
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
RBC = Risk-Based Concentration
V = Validation Qualifier: valid data
µg/g = microgram per gram
µg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
# = Indicates compound exceeds background
- = There is no RBC for that compound

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TABLE 3-8
Surface-Soil Positive Results Data Summary
OU10 - IHSS 174A

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
Test Group:BNACLP Units: µg/kg												
ACENAPHTHENE	330	340	SS003193 (1)	1500	SS001893 (1)	38 J:A	SS001393 (1)	55 J:A	SS001493 (1)	3	25	254
ANTHRACENE	330	340	SS003193 (1)	1500	SS001893 (1)	43 J:A	SS001293 (2)	77 J:A	SS001493 (1)	4	25	249.88
BENZO(a)ANTHRACENE	330	340	SS003193 (1)	1500	SS001893 (1)	39 J:A	SS002293 (1)	230 J:A	SS001493 (1)	11	25	237
BENZO(a)PYRENE	330	340	SS003193 (1)	1500	SS001893 (1)	47 J:A	SS002293 (1)	260 J:A	SS001493 (1)	10	25	246.4
BENZO(b)FLUORANTHENE	330	340	SS003193 (1)	1400	SS001093 (3)	68 J:A	SS003293 (1)	370 J:A	SS001893 (1)	14	25	240.4
BENZO(ghi)PERYLENE	330	340	SS003193 (1)	1500	SS001893 (1)	37 J:A	SS003293 (1)	170 J:A	SS001493 (1)	7	25	246.84
BENZO(k)FLUORANTHENE	330	340	SS003193 (1)	1500	SS001893 (1)	36 J:A	SS003293 (1)	130 J:A	SS001493 (1)	7	25	239.04
BENZOIC ACID	1600	1600	SS003193 (1)	7100	SS001893 (1)	62 J:A	SS001393 (1)	530 J:A	SS001293 (1)	2	25	1275.68
BIS(2-ETHYLHEXYL) PHTHALATE	330	340	SS003193 (1)	720	SS002193 (1)	41 J:A	SS002293 (1)	3200 :J	SS001993 (1)	21	25	515.4
BUTYL BENZYL PHTHALATE	330	340	SS003193 (1)	1500	SS001893 (1)	39 J:A	SS001693 (1)	1400 :V	SS002793 (1)	10	25	315.44
CHRYSENE	330	340	SS003193 (1)	1400	SS001093 (3)	74 J:A	SS001693 (1)	270 J:A	SS001493 (1)	12	25	233.04
FLUORANTHENE	330	720	SS002193 (1)	1400	SS001993 (1)	78 J:A	SS003193 (1)	660 J:A	SS001193 (1)	23	25	243.32
FLUORENE	330	340	SS003193 (1)	1500	SS001893 (1)	40 J:A	SS001493 (1)	40 J:A	SS001493 (1)	1	25	264.8
INDENO(1,2,3-cd)PYRENE	330	340	SS003193 (1)	1500	SS001893 (1)	44 J:A	SS001693 (1)	170 J:A	SS001493 (1)	4	25	259.36
PENTACHLOROPHENOL	1600	1600	SS003193 (1)	7100	SS001893 (1)	39 J:A	SS001293 (1)	39 J:A	SS001293 (1)	1	25	1289.56
PHENANTHRENE	330	340	SS003193 (1)	1400	SS001093 (2)	61 J:A	SS002793 (1)	600 J:A	SS001193 (1)	16	25	228.52
PYRENE	330	**	**	**	**	67 J:A	SS003093 (1)	1700 :J	SS001193 (1)	25	25	303.44
Test Group:METADD Units: mg/kg												
LITHIUM	100	**	**	**	**	3.6 :J	SS001993 (1)	6.5 :V	SS002093 (1)	25	25	5.264
MOLYBDENUM	20	0.54	SS002893 (1)	5.1	SS003093 (1)	.86 :V	SS002493 (1)	1.1 :V	SS002393 (1)	3	25	0.484
STRONTIUM	200	**	**	**	**	7.8 :V	SS002293 (1)	17.3 :V	SS002593 (1)	25	25	10.8
TIN	200	1.7	SS001693 (10)	1.8	SS001193 (11)	2 :J	SS001393 (1)	3.6 :J	SS001093 (1)	4	25	1.22
Test Group:PESTCLP Units: µg/kg												
AROCLOR-1254	160	160	SS002793 (2)	180	SS001093 (5)	920 :V	SS001593 (1)	9000 :V	SS001993 (1)	4	25	708.8
beta-BHC	8	8.2	SS003193 (1)	9	SS001493 (1)	12 :J	SS001893 (1)	20 :V	SS001993 (1)	2	25	5.232
delta-BHC	8	8.2	SS003193 (1)	9	SS001493 (1)	10 :V	SS001993 (1)	10 :V	SS001993 (1)	1	25	4.528
Test Group:SMETCLP Units mg/kg												
ALUMINUM	200	**	**	**	**	4240 :V	SS001493 (1)	7500 :V	SS002093 (1)	25	25	5151.2
ARSENIC	10	**	**	**	**	1.8 :J	SS002893 (1)	6.5 :V	SS002993 (1)	25	25	3.044
BARIUM	200	**	**	**	**	44.9 :V	SS001393 (1)	92.4 :V	SS002593 (1)	25	25	62.276
BERYLLIUM	5	0.26	SS001393 (1)	0.31	SS001293 (2)	.14 :V	SS002293 (1)	35.1 :V	SS001093 (1)	18	25	2.3808
CADMIUM	5	0.34	SS002293 (3)	0.37	SS001093 (4)	.4 :V	SS001793 (2)	.85 :V	SS001693 (1)	10	25	0.3276
CALCIUM	5000	**	**	**	**	1250 :V	SS001893 (1)	3220 :V	SS002793 (1)	25	25	1626.4
CHROMIUM	10	**	**	**	**	6.8 :V	SS001393 (1)	43.5 :V	SS001893 (1)	25	25	11.716
COBALT	50	**	**	**	**	3.2 :V	SS001493 (2)	5.3 :V	SS002093 (1)	25	25	3.972
COPPER	25	14.1	SS002793 (1)	22.8	SS002493 (1)	10.3 :J	SS001493 (1)	108 :V	SS001093 (1)	10	25	17.81
IRON	100	**	**	**	**	6840 :V	SS001093 (1)	9790 :V	SS002093 (1)	25	25	8595.2
LEAD	3	**	**	**	**	18.9 :V	SS002293 (1)	814 :V	SS002193 (1)	25	25	81.104
MAGNESIUM	5000	**	**	**	**	1110 :V	SS001893 (1)	2120 :V	SS002793 (1)	25	25	1708.8
MANGANESE	15	**	**	**	**	106 :V	SS001993 (1)	278 :V	SS002693 (1)	25	25	188.56
MERCURY	0.2	0.05	SS001793 (1)	0.1	SS002493 (1)	.19 :V	SS001993 (1)	.19 :V	SS001993 (1)	1	25	0.0337
NICKEL	40	**	**	**	**	4.6 :V	SS001293 (1)	53.4 :V	SS001893 (1)	25	25	10.916
POTASSIUM	5000	**	**	**	**	1210 :V	SS001093 (1)	2240 :V	SS003493 (1)	25	25	1799.6
SELENIUM	5	0.56	SS002293 (2)	0.62	SS001293 (2)	.63 :V	SS001393 (1)	20.4 :V	SS001093 (1)	5	23	1.5443
SILVER	10	0.44	SS001793 (1)	1.2	SS002093 (2)	.47 :V	SS001693 (1)	.65 :V	SS001593 (1)	4	25	0.4006
SODIUM	5000	144	SS001893 (1)	195	SS001993 (1)	65.8 :V	SS003193 (1)	189 :V	SS001593 (1)	16	25	119.76
THALLIUM	10	0.74	SS002293 (1)	0.82	SS001293 (3)	5.4 :V	SS001093 (1)	5.4 :V	SS001093 (1)	1	25	0.592
VANADIUM	50	**	**	**	**	15.1 :V	SS001493 (1)	43400 :V	SS001093 (1)	25	25	2722.251
ZINC	20	**	**	**	**	39.8 :V	SS001193 (1)	104 :V	SS001693 (1)	25	25	55.596

Notes:
A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BHC = benzene hexachloride
G = Native analyte greater than four times spike added — inorganics
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram

SQL = Sample Quantitation Limit
V = Validation Qualifier: valid data
µg/g = microgram per gram
µg/kg = microgram per kilogram
* = The number of sample locations at that value is shown in parentheses
** = All samples reported with positive results; no non-detects reported

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174B. Samples were collected at locations that were based on a triangular grid in IHSS 174A. Eight samples were collected in the reported dumpster storage area (IHSS/74B). A duplicate sample was collected at SS001893.

As listed in Table 3-7, 46 analytes were detected in the surface-soil at IHSS 174A, including 20 organics and 26 inorganics (or metals). Plate 5 shows detected concentrations of organics, including estimated values, and metals concentrations exceeding background levels. As shown on Plate 5, the phthalates and the PAHs were the most frequently detected compounds at IHSS 174A, although most of the reported values are estimated concentrations. One or more PAH was detected at every location within IHSS 174A. Fluoranthene was detected in almost every sample, but reported concentrations did not exceed the associated RBC.

Benzo(a)pyrene and Aroclor-1254 were the only organics that exceeded the RBC. Three chemicals, benzo(g,h,i)perylene, phenanthrene, and delta-5-5 benzene hexachloride (BHC), do not have RBCs available. Estimated concentrations of benzo(a)pyrene were reported for 10 locations, with five exceeding the risk-based level. These five locations are in the northeastern corner of the site (SS001393 through SS001593 and SS002393 through SS002493) (Plate 5). The average site concentration of benzo(a)pyrene also exceeded the risk-based level. None of the other PAHs and none of the phthalates exceeded available risk-based levels.

Aroclor-1254 was detected in the northeastern portion of the site (Plate 5). All of the reported concentrations at the four locations where Aroclor-1254 was found exceeded the risk-based level. Pentachlorophenol and benzoic acid were also detected at estimated concentrations below the risk level. Of the inorganics, beryllium, chromium, copper, lead, selenium, thallium, vanadium, and zinc exceeded background (Plate 5). However, chromium, copper, selenium and zinc levels were below their respective RBCs. Lead and thallium do not have RBCs available.

Beryllium was found in 18 of 25 samples, mostly on the northeastern side of IHSS 174A. However, background was exceeded at only two locations, SS001093 and SS001993, along the northeastern boundary, and the average beryllium concentration was below background. Lead or vanadium were detected at all sampled locations within IHSS 174A. Lead exceeded background at locations SS001893, SS001993, SS002193, SS002693, and SS002893, which are situated along a northerly line in the eastern portion of the site. Lead levels could not be evaluated using a risk-based level; however, vanadium exceeded background at five locations (SS001093, SS001193, SS001893, SS001993, and SS002193) in the eastern portion for the site. One location (SS001093) was almost 1,000 times above background and approximately 20 times the risk-based level. The average concentration of vanadium, determined to be approximately 2,700 milligrams per kilogram (mg/kg), also exceeded the risk-based value. Average levels of lead also exceeded background. Thallium was found at only one location, SS001093, at the northern tip of the site where it also exceeded background.

Eight samples were collected in the smaller IHSS 174B (Figure 3-5). Table 3-9 identifies the detected analytes by sample location. Summary information is included in Table 3-10. Forty-one analytes were detected including 21 organics and 20 inorganics. Surface-soil data for IHSS 174B are presented on Plate 6, which shows analytical results with reference to sample location points.

Only three chemicals exceeded the risk-based concentration: benzo(a)pyrene, Aroclor-1254, and Aroclor-1260. RBCs were not available for benzo(g,h,i)perylene, dibenzofuran, or phenanthrene. Zinc and copper were the only inorganics exceeding background, but the reported concentrations were not above risk-based levels.

Similar to IHSSs 170 and 174A, PAHs were detected at every sampled location within 174B (Plate 6), but only benzo(a)pyrene exceeded the RBC. This occurred at five locations in the northern half of the site (SS003593 through SS003793 and SS003993 through SS004093). The

TABLE 3-9
Surface-Soil Positive Results
OU10 - IHSS 174B

Sample Location:				SS003593	SS003693	SS003793	SS003893	SS003993	SS004093	SS004193	SS004293
Sample Identification Number:				SSG1102JE	SSG1103JE	SSG1104JE	SSG1105JE	SSG1106JE	SSG1107JE	SSG1108JE	SSG1109JE
Date Sampled:				12-Jan-94	12-Jan-94	19-Jan-94	12-Jan-94	13-Jan-94	19-Jan-94	18-Jan-94	19-Jan-94
Test Group:BNACLP Units: µg/kg	MDL	RBC /	BKGND								
ACENAPHTHENE	330	1.65E 7 /	0.00E 0	56 J:A	44 J:A	52 J:A		120 J:A	47 J:A		
ANTHRACENE	330	8.23E 7 /	0.00E 0	92 J:A	61 J:A	80 J:A		190 J:A	56 J:A		
BENZO(a)ANTHRACENE	330	8.77E 2 /	0.00E 0	210 J:A	160 J:A	180 J:A	63 J:A	280 J:A	130 J:A	62 J:A	56 J:A
BENZO(a)PYRENE	330	8.77E 1 /	0.00E 0	190 J:A*	150 J:A*	190 J:A*	69 J:A	250 J:A*	140 J:A*	71 J:A	60 J:A
BENZO(b)FLUORANTHENE	330	8.77E 2 /	0.00E 0	400 :V	300 J:A	280 J:A	88 J:A	330 J:A	200 J:A	100 J:A	
BENZO(ghi)PERYLENE	330	0.00E 0 /	0.00E 0			58 J:A-					
BENZO(k)FLUORANTHENE	330	8.77E 3 /	0.00E 0	130 J:A				130 J:A	69 J:A		
BENZOIC ACID	1600	1.10E 9 /	0.00E 0	170 J:A	190 J:A		75 J:A	180 J:A		64 J:A	
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 /	0.00E 0	66 J:A	65 J:A	66 J:A	60 J:A	51 J:A	260 J:A	110 J:A	57 J:A
CHRYSENE	330	8.77E 4 /	0.00E 0	330 J:A	160 J:A	220 J:A	75 J:A	260 J:A	150 J:A	74 J:A	61 J:A
DI-n-BUTYL PHTHALATE	330	2.74E 7 /	0.00E 0			54 J:A			84 J:A	49 J:A	71 J:A
DIBENZOFURAN	330	0.00E 0 /	0.00E 0					64 J:A-			
DIETHYL PHTHALATE	330	2.20E 8 /	0.00E 0	48 J:A				93 J:A			
FLUORANTHENE	330	1.10E 7 /	0.00E 0	660 :V	410 :V	470 :V	160 J:A	800 :V	360 :V	170 J:A	150 J:A
FLUORENE	330	1.10E 7 /	0.00E 0	48 J:A		44 J:A		110 J:A	38 J:A		
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 /	0.00E 0			120 J:A	48 J:A		100 J:A	53 J:A	
NAPHTHALENE	330	1.10E 7 /	0.00E 0					110 J:A			
PHENANTHRENE	330	0.00E 0 /	0.00E 0	420 :V-	270 J:A-	360 :V-	100 J:A-	710 :V-	270 J:A-	120 J:A-	98 J:A-
PYRENE	330	8.23E 6 /	0.00E 0	610 :V	370 :V	460 :V	150 J:A	670 :V	310 J:A	160 J:A	130 J:A
Test Group:METADD Units: mg/kg											
LITHIUM	100	0.00E 0 /	20.00E 0	5 :JA	7.5 :JA	5.2 :JA	7.8 :JA	6.7 :JA	5.6 :JA	12.2 :JA	7.8 :JA
STRONTIUM	200	1.65E 5 /	90.10E 0	10.5 :JA	14.3 :JA	10.1 :JA	19.1 :JA	11.6 :JA	8.5 :JA	15.2 :JA	12.3 :JA
Test Group:PESTCLP Units: µg/kg											
AROCLOR-1254	160	8.32E 1 /	0.00E 0							490 :V*	
AROCLOR-1260	160	8.32E 1 /	0.00E 0	200 :V*		570 :V*		680 :V*	500 :V*	210 :JA*	

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TABLE 3-9
Surface-Soil Positive Results
OU10 - IHSS 174B

Sample Location:			SS003593	SS003693	SS003793	SS003893	SS003993	SS004093	SS004193	SS004293
Sample Identification Number:			SSG1102JE	SSG1103JE	SSG1104JE	SSG1105JE	SSG1106JE	SSG1107JE	SSG1108JE	SSG1109JE
Date Sampled:			12-Jan-94	12-Jan-94	19-Jan-94	12-Jan-94	13-Jan-94	19-Jan-94	18-Jan-94	19-Jan-94
Test Group:SMETCLP Units: mg/kg	MDL	RBC/BKGND								
ALUMINUM	200	0.00E 0 / 21915.40E 0	5210 :V	8490 :V	5910 :V	7420 :V	6260 :V	4770 :V	11400 :V	7330 :V
ARSENIC	10	3.66E-1 / 12.90E 0	3.5 :V*	6.4 :V*	4.9 :V*	3.9 :V*	3.4 :V*	2.6 :V*	4.9 :V*	3.1 :V*
BARIUM	200	1.92E 4 / 528.00E 0	82.1 :V	84.8 :V	70.7 :V	97.2 :V	73.1 :V	54.1 :V	110 :V	82.8 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.26 :V	.47 :V	.35 :V	.41 :V	.34 :V	.2 :V	.51 :V	.35 :V
CADMIUM	5	1.37E 2 / 5.00E 0	.47 :JA	.7 :JA	.48 :JA	.58 :JA	.54 :JA		.84 :JA	.47 :JA
CALCIUM	5000	0.00E 0 / 13573.30E 0	1290 :V	1930 :V	1520 :V	2400 :V	2300 :V	1310 :V	4750 :V	2930 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	14.5 :V	18.3 :V	8.6 :V	10.6 :V	11.4 :V	9 :V	14.6 :JA	9.8 :V
COBALT	50	0.00E 0 / 24.80E 0	3.4 :V	4.6 :V	4.1 :V	6.4 :V	4.9 :V	3.7 :V	8.7 :V	5.6 :V
COPPER	25	1.10E 4 / 27.30E 0							28.7 :V#	
IRON	100	0.00E 0 / 28160.40E 0	8650 :V	10900 :V	9110 :V	14100 :V	11600 :V	9380 :V	22200 :V	13900 :V
LEAD	3	0.00E 0 / 61.40E 0	37.5 :V	31 :V	23.8 :V	27.9 :V	20.3 :V	19.4 :V	24.6 :V	22.3 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	1330 :V	1690 :V	1350 :V	2880 :V	1910 :V	1650 :V	5210 :V	3070 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	158 :V	218 :V	183 :V	319 :V	223 :V	178 :V	496 :V	294 :V
NICKEL	40	5.49E 3 / 26.90E 0		7.3 :V		6.8 :V			8.1 :JA	
POTASSIUM	5000	0.00E 0 / 5256.80E 0	1530 :V	2010 :V	1440 :V	2410 :V	2090 :V	1790 :V	3380 :V	2550 :V
SILVER	10	1.37E 3 / 10.00E 0	.78 :V	.91 :V	.92 :V	1.3 :V	1.3 :V	.81 :V	1.9 :JA	1.2 :V
VANADIUM	50	1.92E 3 / 55.60E 0	13.9 :V	21.9 :V	17.5 :V	22.8 :V	16.4 :V	13.2 :V	36.6 :V	21.6 :V
ZINC	20	8.23E 4 / 86.60E 0	106 :V#	59.2 :V	130 :V#	66.1 :V	98.7 :V#	58.1 :V	293 :V#	69.1 :V

<u>Notes:</u>

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BKGND = Background concentration (DOE 1994c)
G = Native analyte greater than four times spike added — inorganics
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
RBC = Risk-Based Concentration
V = Validation Qualifier: valid data
µg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
\# = Indicates compound exceeds background
\- = There is no RBC for that compound

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TABLE 3-10
Surface-Soil Positive Results Data Summary
OU10 - IHSS 174B

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
Test Group:BNACLP Units: µg/kg												
ACENAPHTHENE	330	340	SS004193 (2)	350	SS003893 (1)	44 J:A	SS003693 (1)	120 J:A	SS003993 (1)	5	8	104.25
ANTHRACENE	330	340	SS004193 (2)	350	SS003893 (1)	56 J:A	SS004093 (1)	190 J:A	SS003993 (1)	5	8	124.25
BENZO(a)ANTHRACENE	330	**	**	**	**	56 J:A	SS004293 (1)	280 J:A	SS003993 (1)	8	8	142.625
BENZO(a)PYRENE	330	**	**	**	**	60 J:A	SS004293 (1)	250 J:A	SS003993 (1)	8	8	140
BENZO(b)FLUORANTHENE	330	340	SS004293 (1)	340	SS004293 (1)	88 J:A	SS003893 (1)	400 :V	SS003593 (1)	7	8	233.5
BENZO(ghi)PERYLENE	330	340	SS003993 (4)	360	SS003693 (1)	58 J:A	SS003793 (1)	58 J:A	SS003793 (1)	1	8	158.5
BENZO(k)FLUORANTHENE	330	340	SS004193 (2)	360	SS003693 (1)	69 J:A	SS004093 (1)	130 J:A	SS003593 (2)	3	8	149.875
BENZOIC ACID	1600	1600	SS004093 (1)	1700	SS003793 (2)	64 J:A	SS004193 (1)	190 J:A	SS003693 (1)	5	8	397.375
BIS(2-ETHYLHEXYL) PHTHALATE	330	**	**	**	**	51 J:A	SS003993 (1)	260 J:A	SS004093 (1)	8	8	91.875
CHRYSENE	330	**	**	**	**	61 J:A	SS004293 (1)	330 J:A	SS003593 (1)	8	8	166.25
DI-n-BUTYL PHTHALATE	330	340	SS003993 (1)	360	SS003693 (1)	49 J:A	SS004193 (1)	84 J:A	SS004093 (1)	4	8	119.75
DIBENZOFURAN	330	340	SS004093 (3)	360	SS003693 (1)	64 J:A	SS003993 (1)	64 J:A	SS003993 (1)	1	8	159.875
DIETHYL PHTHALATE	330	340	SS004093 (3)	360	SS003693 (1)	48 J:A	SS003593 (1)	93 J:A	SS003993 (1)	2	8	147.625
FLUORANTHENE	330	**	**	**	**	150 J:A	SS004293 (1)	800 :V	SS003993 (1)	8	8	397.5
FLUORENE	330	340	SS004193 (2)	360	SS003693 (1)	38 J:A	SS004093 (1)	110 J:A	SS003993 (1)	4	8	116.875
INDENO(1,2,3-cd)PYRENE	330	340	SS003993 (2)	360	SS003693 (1)	48 J:A	SS003893 (1)	120 J:A	SS003793 (1)	4	8	127
NAPHTHALENE	330	340	SS004093 (3)	360	SS003693 (1)	110 J:A	SS003993 (1)	110 J:A	SS003993 (1)	1	8	165.625
PHENANTHRENE	330	**	**	**	**	98 J:A	SS004293 (1)	710 :V	SS003993 (1)	8	8	293.5
PYRENE	330	**	**	**	**	130 J:A	SS004293 (1)	670 :V	SS003993 (1)	8	8	357.5
Test Group:METADD Units: mg/kg												
LITHIUM	100	**	**	**	**	5 :J	SS003593 (1)	12.2 :J	SS004193 (1)	8	8	7.225
STRONTIUM	200	**	**	**	**	8.5 :J	SS004093 (1)	19.1 :J	SS003893 (1)	8	8	12.7
Test Group:PESTCLP Units: µg/kg												
AROCLOR-1254	160	160	SS003993 (2)	170	SS003593 (5)	490 :V	SS004193 (1)	490 :V	SS004193 (1)	1	8	134.375
AROCLOR-1260	160	170	SS003693 (3)	170	SS003693 (3)	200 :V	SS003593 (1)	680 :V	SS003993 (1)	5	8	301.875
Test Group:SMETCLP Units: mg/kg												
ALUMINUM	200	**	**	**	**	4770 :V	SS004093 (1)	11400 :V	SS004193 (1)	8	8	7098.75
ARSENIC	10	**	**	**	**	2.6 :V	SS004093 (1)	6.4 :V	SS003693 (1)	8	8	4.0875
BARIUM	200	**	**	**	**	54.1 :V	SS004093 (1)	110 :V	SS004193 (1)	8	8	81.85
BERYLLIUM	5	**	**	**	**	.2 :V	SS004093 (1)	.51 :V	SS004193 (1)	8	8	0.3612
CADMIUM	5	0.34	SS004093 (1)	0.34	SS004093 (1)	.47 :J	SS003593 (2)	.84 :J	SS004193 (1)	7	8	0.5313
CALCIUM	5000	**	**	**	**	1290 :V	SS003593 (1)	4750 :V	SS004193 (1)	8	8	2303.75
CHROMIUM	10	**	**	**	**	8.6 :V	SS003793 (1)	18.3 :V	SS003693 (1)	8	8	12.1
COBALT	50	**	**	**	**	3.4 :V	SS003593 (1)	8.7 :V	SS004193 (1)	8	8	5.175
COPPER	25	10.9	SS003793 (1)	19	SS004293 (1)	28.7 :V	SS004193 (1)	28.7 :V	SS004193 (1)	1	8	10.0437
IRON	100	**	**	**	**	8650 :V	SS003593 (1)	22200 :V	SS004193 (1)	8	8	12480
LEAD	3	**	**	**	**	19.4 :V	SS004093 (1)	37.5 :V	SS003593 (1)	8	8	25.85
MAGNESIUM	5000	**	**	**	**	1330 :V	SS003593 (1)	5210 :V	SS004193 (1)	8	8	2388.25
MANGANESE	15	**	**	**	**	158 :V	SS003593 (1)	496 :V	SS004193 (1)	8	8	258.625
NICKEL	40	4.9	SS004093 (1)	6.4	SS004293 (1)	6.8 :V	SS003893 (1)	8.1 :J	SS004193 (1)	3	8	4.5687
POTASSIUM	5000	**	**	**	**	1440 :V	SS003793 (1)	3380 :V	SS004193 (1)	8	8	2150
SILVER	10	**	**	**	**	.78 :V	SS003593 (1)	1.9 :J	SS004193 (1)	8	8	1.14
VANADIUM	50	**	**	**	**	13.2 :V	SS004093 (1)	36.6 :V	SS004193 (1)	8	8	20.4875
ZINC	20	**	**	**	**	58.1 :V	SS004093 (1)	293 :V	SS004193 (1)	8	8	110.025

Notes:
A = Validation Qualifier: laboratory qualifier considered acceptable
BHC = Benzene hexachloride
G = Native analyte greater than four times spike added — inorganics
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram

V = Validation Qualifier: valid data
SQL = Sample Quantitation Limit
µg/kg = microgram per kilogram
* = The number of sample locations at that value is shown in parentheses
** = All samples reported with positive results; no nondetects reported

average site concentration of benzo(a)pyrene also exceeded the RBC. Aroclor-1254 was detected at one location, SS004193, along the southeastern boundary of the site. Although Aroclor-1254 was also detected at IHSS 170 and IHSS 174A, the various locations at which it was detected are not close to each other. Aroclor-1260 was detected at IHSS 174B at five locations, at each of which it exceeded the RBC. These locations are SS003593 and SS003993 through SS004193, located on the northeastern side of the site, and at SS003793 in the northwestern tip of the site. The average concentration of Aroclor-1260 was also above the risk level.

3.4.3 Soil-Gas Survey

The soil-gas survey was conducted on a 20-foot grid with 14 locations in IHSS 174A. Figure 3-6 presents the location of soil-gas sample points in IHSS 174A. Target analytes detected in concentrations greater than 1.0 μg/L (Section 3.1.3) are listed in Table 3-11. Concentrations of target VOCs equal to or exceeding the target detection limit are illustrated by location on Plate 7. Two locations in IHSS 174A exhibited concentrations of PCE above target detection limits. The maximum concentration at these two locations is 13.00 μg/L of PCE at site SG043694. The lower concentration at 1.50 μg/L of PCE was observed at site SG043994.

Methane was detected in concentrations of 20 ppm at four locations and 30 ppm at one location. Compared with landfill studies in OU7 (DOE 1994d), these concentrations appear to be very low level and can probably be attributed to natural organic decay. No other constituents from Table 2-2 were found above target detection limits at IHSS 174A.

Ten locations were sampled on a 20-foot grid at IHSS 174B. Soil-gas sample locations are presented in Figure 3-7 for IHSS 174B. No constituents from Table 2-2 were found above target detection limits for IHSS 174B.

TABLE 3-11
Target Analytes for OU10-IHSSs 174A and 174B[2]
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

LOCATION NUMBER	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[3]	DETECTION LIMIT
SG043694	SGG0436JE	5/27/94	REAL	Tetrachloroethene	13.00	µg/L	J	0.02
				Methane	20.00	ppm		20.00
SG043794	SGG0437JE	5/27/94	REAL	Methane	20.00	ppm		20.00
SG043894	SGG0438JE	5/27/94	REAL	Methane	20.00	ppm		20.00
SG043994	SGG0439JE	6/3/94	REAL	Tetrachloroethene	1.50	µg/L		0.02
SG044094	SGG0440JE	5/27/94	REAL	Methane	20.00	ppm		20.00
SG044194	SGG0441JE	5/27/94	REAL	Methane	30.00	ppm		20.00

Notes:

1) The target detection level of 1.0 µg/L applies to the following chemicals of concern: 1,1,1-trichloroethane, 2-butanone, acetone, benzene, carbon tetrachloride, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, cis-1,2-dichloroethene, and xylenes.

The field instrument detection level for hydrogen sulfide is 5 ppm.
The field instrument detection level for methane is 20 ppm.
Reported values of 10 ppm are estimated (see Section 3.1.3).

2) No chemicals of concern were detected at 1.00 mg/L or above in IHSS 174B.

J = estimated value

ppm = parts per million
REAL = environmental sample
µg/L = microgram per liter

3.5 IHSS 175 - SWINGERTON AND WALBERG BUILDING 980 CONTAINER STORAGE FACILITY

IHSS 175 is a 25 foot by 25 foot area in the eastern third of a storage yard located south of Building 980. The site was used from approximately 1980 to 1986 for storage of drummed waste from vehicle maintenance and painting activities at the Swingerton and Walberg (S&W) contractor's maintenance and fabrication shops. No more than 10 drums were stored at the site at any time. The drums were placed directly on the ground surface, and a berm was reportedly located on the west, south, and east sides of the overall storage yard. Documentation of spills or leaks is not available, although ground stains are visible.

In 1985, drum sampling found the wastes typically contained paraffinic-based mineral oil, a mixture of paraffinic- and naphthionic-based mineral oil, xylenes, freon, trichlorofluorethane, glycol ether/borate-based brake fluid, aluminum, barium, beryllium, calcium, sodium, lead, silicon, and zinc. In 1988, soil samples were collected as part of an initial soil characterization program (Rockwell et al. 1988). Organics detected were methylene chloride and acetone, although these were also detected in sample blanks. Metals and other inorganics detected included arsenic, barium, beryllium, chromium, iron, manganese, nickel, strontium, vanadium, calcium, cadmium, copper, mercury, lead, magnesium, potassium, zinc, and nitrate/nitrites. Radiochemistry analyses were performed for gross alpha; gross beta; tritium; uranium-233, -234, and -238; plutonium-239 and -240; and americium -241. No upgradient or downgradient analytical groundwater data are known to have been collected.

3.5.1 High Purity Germanium Survey

The HPGe survey data for the sole survey location within IHSS 175 provided no evidence to indicate anomalous activities for potassium-40, radium-226, thorium-232, uranium-235, uranium-238, or plutonium-239 at IHSS 175. The activities for these radionuclides fell within the expected range of background values presented in Table 3-1. Americium-241 was slightly elevated at 0.3 pCi/g; but within the background range for Americium-241 at RFETS (Table 3-1); further this value is not suspected to be anomalous based on the NaI detector work before soil-gas sampling. The HPGe location for IHSS 175 is shown on Plate 1, the Americium Specific Activity Map.

3.5.2 Surface-Soil Sampling

Eleven surface-soil samples were collected at IHSS 175, including one duplicate sample at SS012293. Sample locations are shown in Figure 3-8. Four samples were collected around the perimeter (SS011993, SS012093, SS012693, and SS012593), four were collected within the site (SS012193, SS012393, SS012493, and SS012293), and two were collected outside the IHSS boundary (SS012793 and SS011893).

Forty analytes, including 19 organics and 21 inorganics, were detected in surface-soil. Surface-soil data for IHSS 175 are presented on Plate 8, which shows analytical results with reference to sample location points. Complete analytical results for surface-soil are included in Appendix B. Table 3-12 lists all detected constituents and their concentrations by sample location. Table 3-13 provides summary information for the detected analytes.

As shown in Table 3-13 and on Plate 8, organics detected were mainly PAHs. Phthalates were detected very infrequently at a few locations, and benzoic acid was detected at only one location.

TABLE 3-12
Surface-Soil Positive Results
OU10 - IHSS 175

Sample Location:			SS011893	SS011993	SS012093	SS012193	SS012293	SS012293	SS012393	SS012493	SS012593	SS012693	SS012793
Sample Identification Number:			SSG1201JE	SSG1202JE	SSG1203JE	SSG1204JE	SSG1147JE	SSG1205JE	SSG1206JE	SSG1207JE	SSG1208JE	SSG1209JE	SSG1210JE
Date Sampled:			21-Feb-94	21-Feb-94	22-Feb-94	21-Feb-94	21-Feb-94	21-Feb-94	17-Feb-94	17-Feb-94	17-Feb-94	17-Feb-94	17-Feb-94
Test Group:BNACLP Units: µg/kg	MDL	RBC/ BKGND											
2-METHYLNAPHTHALENE	330	0.00E 0 / 0.00E 0				47 J:A-							
ACENAPHTHENE	330	1.65E 7 / 0.00E 0									48 J:A	43 J:A	
ANTHRACENE	330	8.23E 7 / 0.00E 0									65 J:A	59 J:A	
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0					48 J:A	57 J:A	160 J:A		400 :V	340 J:A	210 J:A
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0			100 J:A*				200 J:A*		470 :V*	390 :V*	280 J:A*
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0			150 J:A			110 J:A	280 J:A	170 J:A	670 :V	660 :V	430 :V
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0									88 J:A-	59 J:A-	53 J:A-
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0			68 J:A				75 J:A	54 J:A	300 J:A	160 J:A	150 J:A
BENZOIC ACID	1600	1.10E 9 / 0.00E 0			51 J:A								
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0								790 B:JA	1500 B:JA		
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0									110 J:A	76 J:A	
CHRYSENE	330	8.77E 4 / 0.00E 0			120 J:A	42 J:A	65 J:A	69 J:A	190 J:A	120 J:A	470 :V	410 :V	260 J:A
DI-n-BUTYL PHTHALATE	330	2.74E 7 / 0.00E 0			46 J:A					61 J:A	91 J:A		
DIMETHYL PHTHALATE	330	2.74E 9 / 0.00E 0							81 J:A				
FLUORANTHENE	330	1.10E 7 / 0.00E 0			300 J:A	87 J:A	140 J:A	150 J:A	460 :V	260 J:A	1100 :V	960 :V	600 :V
FLUORENE	330	1.10E 7 / 0.00E 0									38 J:A		
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0							83 J:A				
PHENANTHRENE	330	0.00E 0 / 0.00E 0			130 J:A-	160 J:A-	61 J:A-	67 J:A-	200 J:A-	110 J:A-	570 :V-	460 :V-	260 J:A-
PYRENE	330	8.23E 6 / 0.00E 0							420 B:JA		900 B:JA	820 B:JA	530 B:JA
Test Group:METADD Units: mg/kg													
LITHIUM	100	0.00E 0 / 20.00E 0	5.6 B:JA	7 B:JA	4.3 B:JA	7.4 B:JA	7.3 B:JA	7.4 B:JA	7.9 B:JA	7.8 B:JA	6.8 B:JA	6.5 B:JA	5.4 B:JA
STRONTIUM	200	1.65E 5 / 90.10E 0	11.1 B:JA	14.1 B:JA	10.8 B:JA	16.2 B:JA	12.1 B:JA	12.6 B:JA	41.7 B:JA	39 B:JA	34.7 B:JA	36.5 B:JA	25.3 B:JA
Test Group:SMETCLP Units: mg/kg													
ALUMINUM	200	0.00E 0 / 21915.40E 0	5460 :V	7000 :V	4240 :V	6720 :V	6370 :V	6310 :V	8160 :V	8030 :V	7700 :V	8200 :V	8710 :V
ARSENIC	10	3.66E-1 / 12.90E 0	1.9 B:V*	2.9 :V*	2.2 B:V*	2.6 :V*	2.4 :V*	2.6 :V*	3.9 :V*	3.8 :V*	5.1 :V*	4.4 :V*	6.4 :V*
BARIUM	200	1.92E 4 / 528.00E 0	51.3 :V	61.6 :V	41 B:V	53.5 :V	52 :V	49 :V	74 :V	80.8 :V	81.4 :V	101 :V	121 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.26 B:V	.36 B:V	.18 B:V	.35 B:V	.28 B:V	.31 B:V	.46 B:V	.45 B:V	.5 B:V	.6 B:V	.71 B:V
CADMIUM	5	1.37E 2 / 5.00E 0					.37 B:V	.39 B:V	.44 B:V	.91 B:V	.74 B:V	.59 B:V	
CALCIUM	5000	0.00E 0 / 13573.30E 0	2950 :V	4420 :V	3420 :V	5630 :V	3440 :V	3260 :V	36900 :V#	39000 :V#	36500 :V#	23400 :V#	5800 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	19.9 :V	17.2 :V	17 :V	48.1 :V#	28.3 :V#	22.7 :V	19.2 :V	20 :V	27.7 :V#	19.5 :V	15.7 :V
COBALT	50	0.00E 0 / 24.80E 0	3.5 B:V	4.7 B:V	3.2 B:V	4.5 B:V	4.1 B:V	4.2 B:V	4.5 B:V	4.8 B:V	5.1 B:V	7.1 B:V	6.6 B:V
COPPER	25	1.10E 4 / 27.30E 0	13.5 :V	13.7 :V	20 :V	22.4 :V	35.9 :V#	35.4 :V#	28.8 :V#	26.8 :V	56.5 :V#	32.7 :V#	18.6 :V
IRON	100	0.00E 0 / 28160.40E 0	10400 :V	12200 :V	10500 :V	15400 :V	12400 :V	13400 :V	12600 :V	12200 :V	12900 :V	12900 :V	15100 :V
LEAD	3	0.00E 0 / 61.40E 0	10.5 :JA	11.5 :JA	21.8 :JA	15.6 :JA	17.7 :JA	16.8 :JA	20.8 :V	22.7 :V	28.6 :V	37.7 :V	21.1 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	1770 :V	2150 :V	1500 :V	2050 :V	2040 :V	1970 :V	2490 :V	2360 :V	1990 :V	2090 :V	1850 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	123 :JA	150 :JA	121 :JA	143 :JA	175 :JA	157 :JA	152 :JA	160 :JA	173 :JA	230 :JA	324 :JA
MERCURY	0.2	8.23E 1 / 0.20E 0										.23 :V#	
NICKEL	40	5.49E 3 / 26.90E 0	15.8 :V	11.1 :V	15.1 :V	35.3 :V#	18.8 :V	14.7 :V	14.1 :V	14.9 :V	24.4 :V	15.2 :V	16.1 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	1600 :V	1930 :V	1310 :V	1840 :V	1960 :V	1820 :V	2080 :V	1980 :V	1820 :V	2130 :V	1970 :V
SILVER	10	1.37E 3 / 10.00E 0		.59 B:JA		1.2 B:JA		.43 B:JA				.81 B:V	.71 B:V
VANADIUM	50	1.92E 3 / 55.60E 0	17 :V	21 :V	13.1 :V	20.2 :V	19.9 :V	20 :V	20.5 :V	20.5 :V	20.1 :V	21.8 :V	24.5 :V
ZINC	20	8.23E 4 / 86.60E 0	31.8 :V	39.5 :V	73.1 :V	65.5 :V	73 :V	66 :V	70.3 :V	93 :V#	110 :V#	87.8 :V#	63.4 :V

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BKGND = Background concentration (DOE 1994c)
J = Laboratory Qualifier: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram

RBC = Risk-Based Concentration
SQL = Sample Quantitation Limit
V = Validation Qualifier: valid data
µg/g = microgram per gram
µg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
** = All samples reported with positive results; no non-detects reported
# = Indicates compound exceeds background
- = There is no RBC for that compound

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TABLE 3-13
Surface-Soil Positive Results Data Summary
OU10 - IHSS 175

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
Test Group:BNACLP Units: µg/kg												
2-METHYLNAPHTHALENE	330	340	SS011893 (1)	380	SS012093 (2)	47 J:A	SS012193 (1)	47 J:A	SS012193 (1)	1	10	169.2
ACENAPHTHENE	330	340	SS011893 (1)	380	SS012093 (2)	43 J:A	SS012693 (1)	48 J:A	SS012593 (1)	2	10	155.1
ANTHRACENE	330	340	SS011893 (1)	380	SS012093 (2)	59 J:A	SS012693 (1)	65 J:A	SS012593 (1)	2	10	158.4
BENZO(a)ANTHRACENE	330	340	SS011893 (1)	380	SS012093 (1)	57 J:A	SS012293 (1)	400 :V	SS012593 (1)	5	10	207.2
BENZO(a)PYRENE	330	340	SS011893 (1)	370	SS012193 (2)	100 J:A	SS012093 (1)	470 :V	SS012593 (1)	5	10	233.5
BENZO(b)FLUORANTHENE	330	340	SS011893 (1)	370	SS012193 (1)	110 J:A	SS012293 (1)	670 :V	SS012593 (1)	7	10	300
BENZO(ghi)PERYLENE	330	340	SS011893 (1)	380	SS012093 (1)	53 J:A	SS012793 (1)	88 J:A	SS012593 (1)	3	10	147
BENZO(k)FLUORANTHENE	330	340	SS011893 (1)	370	SS012193 (1)	54 J:A	SS012493 (1)	300 J:A	SS012593 (1)	6	10	151.7
BENZOIC ACID	1600	1600	SS011893 (1)	1800	SS012193 (6)	51 J:A	SS012093 (1)	51 J:A	SS012093 (1)	1	10	795.1
BIS(2-ETHYLHEXYL) PHTHALATE	330	340	SS011893 (1)	380	SS012093 (2)	790 B:J	SS012493 (1)	1500 B:J	SS012593 (1)	2	10	375
BUTYL BENZYL PHTHALATE	330	340	SS011893 (1)	380	SS012093 (2)	76 J:A	SS012693 (1)	110 J:A	SS012593 (1)	2	10	164.6
CHRYSENE	330	340	SS011893 (1)	350	SS011993 (1)	42 J:A	SS012193 (1)	470 :V	SS012593 (1)	8	10	202.6
DI-n-BUTYL PHTHALATE	330	340	SS011893 (1)	380	SS012793 (1)	46 J:A	SS012093 (1)	91 J:A	SS012593 (1)	3	10	146.8
DIMETHYL PHTHALATE	330	340	SS011893 (1)	380	SS012093 (2)	81 J:A	SS012393 (1)	81 J:A	SS012393 (1)	1	10	172.6
FLUORANTHENE	330	340	SS011893 (1)	350	SS011993 (1)	87 J:A	SS012193 (1)	1100 :V	SS012593 (1)	8	10	426.2
FLUORENE	330	340	SS011893 (1)	380	SS012093 (2)	38 J:A	SS012593 (1)	38 J:A	SS012593 (1)	1	10	168.3
INDENO(1,2,3-cd)PYRENE	330	340	SS011893 (1)	380	SS012093 (2)	83 J:A	SS012393 (1)	83 J:A	SS012393 (1)	1	10	172.8
PHENANTHRENE	330	340	SS011893 (1)	350	SS011993 (1)	67 J:A	SS012293 (1)	570 :V	SS012593 (1)	8	10	230.2
PYRENE	330	340	SS011893 (1)	380	SS012093 (1)	420 B:J	SS012393 (1)	900 B:J	SS012593 (1)	4	10	375.5
Test Group:METADD Units: mg/kg												
LITHIUM	100	**	**	**	**	4.3 B:J	SS012093 (1)	7.9 B:J	SS012393 (1)	10	10	6.61
STRONTIUM	200	**	**	**	**	10.8 B:J	SS012093 (1)	41.7 B:J	SS012393 (1)	10	10	24.2
Test Group:PESTCLP Units: µg/kg												
Test Group:SMETCLP Units: mg/kg												
ALUMINUM	200	**	**	**	**	4240 :V	SS012093 (1)	8710 :V	SS012793 (1)	10	10	7059
ARSENIC	10	**	**	**	**	1.9 B:V	SS011893 (1)	6.4 :V	SS012793 (1)	10	10	3.58
BARIUM	200	**	**	**	**	41 B:V	SS012093 (1)	121 :V	SS012793 (1)	10	10	71.76
BERYLLIUM	5	**	**	**	**	.18 B:V	SS012093 (1)	.71 B:V	SS012793 (1)	10	10	0.418
CADMIUM	5	0.34	SS011893 (1)	0.38	SS012093 (2)	.39 B:V	SS012293 (1)	.91 B:V	SS012493 (1)	5	10	0.3975
CALCIUM	5000	**	**	**	**	2950 :V	SS011893 (1)	39000 :V	SS012493 (1)	10	10	16146
CHROMIUM	10	**	**	**	**	15.7 :V	SS012793 (1)	48.1 :V	SS012193 (1)	10	10	23.26
COBALT	50	**	**	**	**	3.2 B:V	SS012093 (1)	7.1 B:V	SS012693 (1)	10	10	4.82
COPPER	25	**	**	**	**	13.5 :V	SS011893 (1)	56.5 :V	SS012593 (1)	10	10	26.89
IRON	100	**	**	**	**	10400 :V	SS011893 (1)	15400 :V	SS012193 (1)	10	10	12760
LEAD	3	**	**	**	**	10.5 :J	SS011893 (1)	37.7 :V	SS012693 (1)	10	10	20.8
MAGNESIUM	5000	**	**	**	**	1500 :V	SS012093 (1)	2490 :V	SS012393 (1)	10	10	2029
MANGANESE	15	**	**	**	**	121 :J	SS012093 (1)	324 :J	SS012793 (1)	10	10	175.1
MERCURY	0.2	0.05	SS012393 (2)	0.06	SS012593 (2)	.23 :V	SS012693 (1)	.23 :V	SS012693 (1)	1	10	0.0473
NICKEL	40	**	**	**	**	11.1 :V	SS011993 (1)	35.3 :V	SS012193 (1)	10	10	18.08
POTASSIUM	5000	**	**	**	**	1310 :V	SS012093 (1)	2130 :V	SS012693 (1)	10	10	1862
SILVER	10	0.42	SS011893 (1)	0.47	SS012093 (1)	.43 B:J	SS012293 (1)	1.2 B:J	SS012193 (1)	5	10	0.485
VANADIUM	50	**	**	**	**	13.1 :V	SS012093 (1)	24.5 :V	SS012793 (1)	10	10	19.87
ZINC	20	**	**	**	**	31.8 :V	SS011893 (1)	110 :V	SS012593 (1)	10	10	70.74

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
G = Native analyte greater than four times spike added — inorganics
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram

V = Validation Qualifier: valid data
SQL = Sample Quantitation Limit
µg/g = microgram per gram
µg/kg = microgram per kilogram
* = The number of sample locaitons at that value is shown in parentheses
** = All samples reported with positive results; no nondetects reported

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Chrysene and benzo(g,h,i)perylene were the most frequently detected PAHs; benzo(g,h,i)perylene does not have an RBC. Other detected organics without risk-based values are 2-methylnaphthalene and phenanthrene. Benzo(a)pyrene is the only organic that exceeded the RBC. This occurred in the southern third of the site, outside the southern boundary (at SS012793) and at the location in the northeast corner. No organics were detected in the northwest corner at the location outside the northern boundary.

Inorganics that exceeded background included calcium, chromium, copper, nickel, and zinc. Mercury was also slightly over background levels. Available RBCS were not exceeded. Inorganics did not exceed background at the same locations where organics were not detected (SS011993 and SS011893) indicating no contamination at these locations.

3.5.3 Soil-Gas Survey

Eleven soil-gas locations illustrated in Figure 3-9 were sampled at IHSS 175. Table 3-14 lists the soil-gas results equal to or exceeding the target detection limit of 1.0 μg/L (Section 3.1.3). Target analytes equal to or exceeding the target detection limit of 1.0 μg/L are summarized with reference to sample location on Plate 9.

One location, SG040994, exhibited a concentration of cis-1,2-dichloroethene in the amount of 1.17 μg/L.

Methane was detected at seven locations in the IHSS with concentrations ranging from a minimum of 10.0 ppm at one location and a maximum of 40.0 ppm at one location. Compared with landfill studies in OU7, these concentrations appear to be very low level and can probably

TABLE 3-14
Target Analytes for OU10 - IHSS 175 Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

LOCATION NUMBER	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER	DETECTION LIMIT
SG040894	SGG0408JE	8/02/94	REAL	Methane	30.00	ppm		20.00
SG040994	SGG0409JE	8/01/94	REAL	cis-1,2-dichloroethene	1.17	µg/L		0.06
SG041094	SGG0410JE	8/02/94	REAL	Methane	40.00	ppm		20.00
SG041494	SGG0414JE	8/02/94	REAL	Methane	20.00	ppm		20.00
SG041594	SGG0415JE	8/02/94	REAL	Methane	20.00	ppm		20.00
SG041694	SGG0416JE	8/03/94	REAL	Methane	20.00	ppm		20.00
SG041794	SGG0417JE	8/03/94	REAL	Methane	10.00	ppm		20.00
SG041894	SGG0418JE	8/02/94	REAL	Methane	20.00	ppm		20.00

<u>Notes:</u>

1) The target detection level of 1.0 µg/L applies to the following chemicals of concern: 1,1,1-trichloroethane, 2-butanone, acetone, benzene, carbon tetrachloride, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, cis-1,2-dichloroethene, and xylenes.

The field instrument detection level for hydrogen sulfide is 5 ppm.
The field instrument detection level for methane is 20 ppm.
Reported values of 10 ppm are estimated (see Section 3.1.3).

ppm = parts per million
REAL = environmental sample
µg/L = microgram per liter

be attributed to natural organic decay (DOE 1994d). No other constituents from Table 2-2 were found above the target detection limit of 1.0 μg/L at this IHSS.

3.6 IHSS 176 - SWINGERTON AND WALBERG CONTRACTOR STORAGE YARD

The S&W Contractor Storage Yard lies approximately 50 feet east of the Solar Evaporation Ponds in the vicinity of Building 964. The site is approximately 290 by 390 feet in area according to the IAG (DOE et al. 1991), but the actual area used for storage appears to be considerably larger, based on aerial photographs (DOE 1992a).

Since 1970, the storage yard has been used for storage of contractor materials used in various projects at the facility. Drummed storage occurred from 1970 to 1985. Containers were stored in numerous areas at the site throughout this time. The amount of waste stored is unknown. Containers had been placed directly on the ground surface or on pallets.

In 1985, materials that qualified as hazardous waste were identified in several areas. Sampling and analysis of the drummed waste determined that the components were primarily mineral spirits, water, waste oil, volatile organics, and metals. The drums were subsequently removed and disposed of as hazardous waste. Since then, most of the area has been used for storage of surplus or raw materials for construction or maintenance projects.

An initial soil characterization program was conducted with soil samples collected in 1988 from 10 locations at the site. Analysis of soil samples taken from borings in the area indicated levels of methylene chloride and acetone above the detection limit, although both were detected in the sample blanks. Inorganics detected include aluminum, arsenic, barium, beryllium, chromium, sodium, thallium, calcium, cadmium, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, vanadium, zinc, strontium, nitrate/nitrate. Radionuclides detected include gross alpha; gross beta; tritium; americium-241; plutonium-239, -240; uranium-238; and uranium-233, -234 (DOE 1992a).

Previous groundwater sampling has been conducted at several wells in the vicinity of IHSS 176, both upgradient and downgradient of the IHSS. Inorganics and radionuclides located in the groundwater beneath IHSS 176 that were not detected in upgradient samples are cobalt, mercury, potassium, zinc, carbonate, gross alpha, and strontium-90. This may indicate that IHSS 176 is the source of these contaminants, but more information is needed from the proposed soil borings and wells at the site (DOE 1992a).

3.6.1 High Purity Germanium Survey

The HPGe survey data for the 39 survey locations within IHSS 176 indicates that a number of locations are potentially contaminated with radionuclides. However, further analysis of the data indicates a positive correlation between the HPGe sample points that appeared contaminated and proximity to either the Solar Evaporation Ponds or Building 964. The Solar Evaporation Ponds have been used for the storage and evaporation of low-level radioactive liquids and have a variety of radionuclides in the liquids and sludges of the ponds. Building 964 is a low-level mixed-waste storage building storing vacuum filter sludge. Vacuum filter sludge contains elevated levels of radionuclides, particularly uranium and plutonium isotopes as well as americium-241.

It is believed that the potentially elevated readings for radionuclides identified by the HPGe detector in IHSS 176 are a result of "shine" from the Solar Evaporation Ponds or Building 964. "Shine" which results from poor shielding of the HGPe detector array from ancillary sources of radiation, has been noted, with the HPGe detector in other OUs near buildings that house radioactive sources at RFETS. Furthermore, NaI radiation detector work done in IHSS 176 also indicated radiation emanating from Building 964. Additionally, contaminated equipment stored in the area at the time of the survey could interfere with detection of radionuclides in the soil. Therefore, elevated radionuclide readings measured by HPBe or NaI detectors in the vicinity of Building 964 were not suspected to be anomalous (see Recommendations, Section 6.6). HPGe locations are illustrated on Plate 1, the Americium Specific Activity Map.

3.6.2 Surface-Soil Sampling

Because investigative information indicated that surface storage at IHSS 176 extended to the north and east of the IHSS boundaries defined in the IAG, the sampling program was extended to include this area. A total of 28 locations were sampled for characterization of surface-soil contamination: 18 located within or along the IHSS boundaries; three on the east side of the IHSS; and seven situated north of the IHSS (Figure 3-10). Duplicate samples were collected at two of the sample locations.

All detected constituents are presented in Table 3-15. Table 3-16 is a summary of the analytical data for IHSS 176. Figure 3-10 presents surface sample locations. Surface-soil data for IHSS 176 are also presented on Plate 10, which shows analytical results with reference to sample location points.

Organics detected in surface-soil include PAHs, several pthalates and phenols, benzoic acid, and Aroclor-1254 and -1260. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, fluoranthene, and phenanthrene were the most frequently detected PAHs. Five of the detected PAHs had concentrations that exceeded risk-based levels. These included benzo(a)anthracene,

TABLE 3-15
Surface-Soil Positive Results
OU10 - IHSS 176

Sample Location:			SS007893	SS007993	SS008093	SS008193	SS008293	SS008393	SS008493	SS008593	SS008693	SS008793	SS008893	SS008893	SS008993	SS009093	SS009193
Sample Identification Number:			SSG1161JE	SSG1162JE	SSG1163JE	SSG1164JE	SSG1165JE	SSG1166JE	SSG1167JE	SSG1168JE	SSG1169JE	SSG1170JE	SSG1138JE	SSG1171JE	SSG1172JE	SSG1173JE	SSG1174JE
Date Sampled:			7-Feb-94	7-Feb-94	7-Feb-94	8-Feb-94	8-Feb-94	7-Feb-94	8-Feb-94	3-Feb-94	3-Feb-94	3-Feb-94	31-Jan-94	31-Jan-94	31-Jan-94	1-Feb-94	2-Feb-94
Test Group:BNACLP Units: µg/kg	MDL	RBC / BKGND															
2-METHYLNAPHTHALENE	330	0.00E 0 / 0.00E 0															
4-CHLORO-3-METHYLPHENOL	330	0.00E 0 / 0.00E 0															
4-METHYLPHENOL	330	1.37E 6 / 0.00E 0			190 J:A												
ACENAPHTHENE	330	1.65E 7 / 0.00E 0											120 J:A	140 J:A			
ANTHRACENE	330	8.23E 7 / 0.00E 0								37 J:A			130 J:A	140 J:A			
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0	50 J:A	120 J:A			57 J:A	150 J:A	160 J:A	180 J:A		59 J:A	340 J:A	360 J:A			
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0		150 J:A*				160 J:A*	180 J:A*	220 J:A*		70 J:A	370 J:A*	400 :V*	45 J:A	53 J:A	
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0	71 J:A	190 J:A			80 J:A	260 J:A	250 J:A	280 J:A		85 J:A	470 :V	490 :V	61 J:A		
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0															
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0		64 J:A				96 J:A	98 J:A	97 J:A			170 J:A	200 J:A			
BENZOIC ACID	1600	1.10E 9 / 0.00E 0												52 J:A			
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0						1200 B:V		3100 BD:V							
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0						90 J:A									
CHRYSENE	330	8.77E 4 / 0.00E 0	56 J:A	140 J:A					190 J:A	220 J:A		64 J:A	390 :V	410 :V	49 J:A	53 J:A	
DI-n-BUTYL PHTHALATE	330	2.74E 7 / 0.00E 0												55 J:A	57 J:A		
DI-n-OCTYL PHTHALATE	330	5.49E 6 / 0.00E 0						72 J:A									
DIBENZO(a,h)ANTHRACENE	330	8.77E 1 / 0.00E 0											73 J:A	70 J:A			
DIBENZOFURAN	330	0.00E 0 / 0.00E 0															
DIMETHYL PHTHALATE	330	2.74E 9 / 0.00E 0															
FLUORANTHENE	330	1.10E 7 / 0.00E 0	140 J:A	290 J:A	89 J:A		140 J:A	360 J:A	400 :V	440 :V	46 J:A	150 J:A	840 :V	920 :V	110 J:A	120 J:A	
FLUORENE	330	1.10E 7 / 0.00E 0											87 J:A	98 J:A			
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0		100 J:A				110 J:A	110 J:A	120 J:A			270 J:A	280 J:A			
NAPHTHALENE	330	1.10E 7 / 0.00E 0															
PENTACHLOROPHENOL	1600	5.34E 3 / 0.00E 0												50 J:A			
PHENANTHRENE	330	0.00E 0 / 0.00E 0	110 J:A-	190 J:A-	57 J:A-		110 J:A-	210 J:A-	270 J:A-	250 J:A-		91 J:A-	670 :V-	750 :V-	68 J:A-	67 J:A-	
PYRENE	330	8.23E 6 / 0.00E 0								430 :V	42 J:A	150 J:A	910 :V	1200 :V	95 J:A	120 J:A	
Test Group:METADD Units: mg/kg																	
CESIUM	1000	0.00E 0 / 630.80E 0		16.2 :V					18.8 :V	4.1 :V	4 :V	6.1 :V					4.1 :V
LITHIUM	100	0.00E 0 / 20.00E 0	8.8 :V	8.7 :V	5.7 :V	9.5 :V	8.8 :V	11.6 :V	12.3 :V	7.6 :V	9.1 :V	8.7 :V	11.4 :JA	12.2 :JA	6.7 :JA	9.2 :JA	8.2 :V
MOLYBDENUM	200	9.64E 0 / 40.00E 0								5.8 :V							
STRONTIUM	200	1.65E 5 / 90.10E 0	9.5 :V	21.6 :V	24 :V	10.2 :V	8.8 :V	22.5 :V	25.1 :V	12.4 :V	9.7 :V	8.5 :V	19.4 :JA	20.5 :JA	42.8 :JA	12.8 :JA	8.8 :V
TIN	200	0.00E 0 / 75.90E 0		2 :V													
Test Group:PESTCLP Units: µg/kg																	
AROCLOR-1254	160	8.32E 1 / 0.00E 0							210 :V*								
AROCLOR-1260	160	8.32E 1 / 0.00E 0															

TABLE 3-15
Surface-Soil Positive Results
OU10 - IHSS 176

Sample Location:			SS009293	SS009393	SS009393	SS009493	SS009593	SS009693	SS009793	SS009893	SS009993	SS010093	SS010193	SS010293	SS010393	SS010493	SS010593
Sample Identification Number:			SSG1175JE	SSG1142JE	SSG1176JE	SSG1177JE	SSG1178JE	SSG1179JE	SSG1180JE	SSG1181JE	SSG1182JE	SSG1183JE	SSG1184JE	SSG1185JE	SSG1186JE	SSG1187JE	SSG1188JE
Date Sampled:			2-Feb-94	9-Feb-94	9-Feb-94	9-Feb-94	10-Feb-94	10-Feb-94	9-Feb-94	9-Feb-94	10-Feb-94	15-Feb-94	15-Feb-94	15-Feb-94	16-Feb-94	16-Feb-94	16-Feb-94
Test Group:BNACLP Units: µg/kg	MDL	RBC / BKGND															
2-METHYLNAPHTHALENE	330	0.00E 0 / 0.00E 0									39 J:A-						
4-CHLORO-3-METHYLPHENOL	330	0.00E 0 / 0.00E 0										60 J:A-					
4-METHYLPHENOL	330	1.37E 6 / 0.00E 0															
ACENAPHTHENE	330	1.65E 7 / 0.00E 0	160 J:A			47 J:A					470 :V						58 J:A
ANTHRACENE	330	8.23E 7 / 0.00E 0	260 J:A			71 J:A					670 :V						98 J:A
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0	660 :V		57 J:A	140 J:A			50 J:A		1800 :V*	68 J:A					230 J:A
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0	720 :V*	50 J:A	69 J:A	130 J:A*	67 J:A	36 J:A	54 J:A		1700 :V*	79 J:A				69 J:A	190 J:A*
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0	1100 :V*	69 J:A	98 J:A	160 J:A	50 J:A	63 J:A	80 J:A		2400 :V*	100 J:A				94 J:A	270 J:A
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0					75 J:A-				240 J:A-	58 J:A-					
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0	400 :V			58 J:A					770 :V						110 J:A
BENZOIC ACID	1600	1.10E 9 / 0.00E 0															
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0			1400 B:V							430 :V			4200 B:JA	7900 BD:JA	9400 BD:JA
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0			38 J:A												
CHRYSENE	330	8.77E 4 / 0.00E 0	710 :V	57 J:A	70 J:A	150 J:A	43 J:A	56 J:A	66 J:A		1800 :V	120 J:A				88 J:A	230 J:A
DI-n-BUTYL PHTHALATE	330	2.74E 7 / 0.00E 0															
DI-n-OCTYL PHTHALATE	330	5.49E 6 / 0.00E 0	42 J:A														
DIBENZO(a,h)ANTHRACENE	330	8.77E 1 / 0.00E 0	52 J:A								240 J:A*						
DIBENZOFURAN	330	0.00E 0 / 0.00E 0	58 J:A-								170 J:A-						
DIMETHYL PHTHALATE	330	2.74E 9 / 0.00E 0						250 J:A									
FLUORANTHENE	330	1.10E 7 / 0.00E 0	1600 :V	120 J:A	140 J:A	390 J:A	86 J:A	110 J:A	130 J:A	51 J:A	4600 D:V	160 J:A	53 J:A		52 J:A	220 J:A	580 :V
FLUORENE	330	1.10E 7 / 0.00E 0	140 J:A								390 :V						45 J:A
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0	220 J:A	40 J:A	48 J:A	77 J:A	40 J:A				1000 :V*	53 J:A					78 J:A
NAPHTHALENE	330	1.10E 7 / 0.00E 0	56 J:A								150 J:A						
PENTACHLOROPHENOL	1600	5.34E 3 / 0.00E 0															
PHENANTHRENE	330	0.00E 0 / 0.00E 0	1100 :V-	57 J:A-	80 J:A-	330 J:A-	52 J:A-	58 J:A-	87 J:A-		3300 D:V-	64 J:A-				170 J:A-	500 :V-
PYRENE	330	8.23E 6 / 0.00E 0	1600 :V								3500 BD:V	150 J:A					550 B:JA
Test Group:METADD Units: mg/kg																	
CESIUM	1000	0.00E 0 / 630.80E 0															
LITHIUM	100	0.00E 0 / 20.00E 0	6.2 :V	9.6 B:JA	9.1 B:JA	7.6 B:JA	9.7 B:JA	9.9 B:JA	7.8 B:JA	4.6 B:JA	8.2 B:JA	3 B:JA	15 B:JA	12.8 B:JA	10.9 B:JA	10.9 B:JA	18.4 B:JA
MOLYBDENUM	200	9.64E 0 / 40.00E 0															
STRONTIUM	200	1.65E 5 / 90.10E 0	11.8 :V	23.4 B:JA	19.8 B:JA	10.8 B:JA	13.2 B:JA	12.9 B:JA	15.5 B:JA	18.3 B:JA	16.7 B:JA	7.9 B:JA	25.6 B:JA	39.1 B:JA	68.4 :JA	44.2 :JA	26 B:JA
TIN	200	0.00E 0 / 75.90E 0															
Test Group:PESTCLP Units: µg/kg																	
AROCLOR-1254	160	8.32E 1 / 0.00E 0		540 :V*	410 :V*						290 :V*				890 :V*	5000 C:V*	8900 C:JA*
AROCLOR-1260	160	8.32E 1 / 0.00E 0		310 :V*													

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TABLE 3-15
Surface-Soil Positive Results
OU10 - IHSS 176

Sample Location:			SS007893	SS007993	SS008093	SS008193	SS008293	SS008393	SS008493	SS008593	SS008693	SS008793	SS008893	SS008893	SS008993	SS009093	SS009193
Sample Identification Number:			SSG1161JE	SSG1162JE	SSG1163JE	SSG1164JE	SSG1165JE	SSG1166JE	SSG1167JE	SSG1168JE	SSG1169JE	SSG1170JE	SSG1136JE	SSG1171JE	SSG1172JE	SSG1173JE	SSG1174JE
Date Sampled:			7-Feb-94	7-Feb-94	7-Feb-94	8-Feb-94	8-Feb-94	7-Feb-94	8-Feb-94	3-Feb-94	3-Feb-94	3-Feb-94	31-Jan-94	31-Jan-94	31-Jan-94	1-Feb-94	2-Feb-94
Test Group:SMETCLP Units: mg/kg	MDL	RBC/BKGND															
ALUMINUM	200	0.00E 0 / 21915.40E 0	6670 :V	7590 :V	5210 :V	7560 :V	6950 :V	10600 :V	10500 :V	6330 :V	7140 :V	6980 :V	11300 :V	11900 :V	7620 :V	7790 :V	6690 :V
ARSENIC	10	3.66E-1 / 12.90E 0	2.6 :V*	9.1 :V*	6.4 :V*	4.2 :V*	2.7 :V*	17.6 :V*#	28 :V*#	5.6 :V*	2.6 :V*	2.5 :V*	34.4 :V*#	33.8 :V*#	10.1 :V*	4.4 :V*	2.3 :V*
BARIUM	200	1.92E 4 / 528.00E 0	67.1 :V	90 :V	63.1 :V	71.2 :V	68.6 :V	109 :V	105 :V	61.3 :V	69.6 :V	65.4 :V	106 :V	110 :V	95 :V	71.6 :V	65.1 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0		.79 :V	.53 :V			1.2 :V	2.1 :V*	.63 :V	.48 :V	.36 :V	.68 :V	.65 :V	.64 :V	.33 :JA	.38 :V
CADMIUM	5	1.37E 2 / 5.00E 0		8.8 :JA#	4.5 :JA	.5 :JA	.78 :JA	8.9 :JA#	14 :JA#	7.3 :V#	.98 :V	.66 :V	9 :V#	8.5 :V#	2.5 :V	1.7 :V	.53 :V
CALCIUM	5000	0.00E 0 / 13573.30E 0	1930 :V	4610 :V	8260 :V	1960 :V	1650 :V	6100 :V	10200 :V	3020 I:JA	1700 I:JA	1510 I:JA	4610 :V	4470 :V	9410 :V	2700 :V	1520 I:JA
CHROMIUM	10	9.62E 2 / 24.80E 0	13.1 :V	16.5 :V	15.3 :V	17.4 :V	13.7 :V	18.6 :V	25.2 :V#	22.8 :V	12.6 :V	12.7 :V	14.4 :V	13.8 :V	13.9 :V	14.6 :V	12.6 :V
COBALT	50	0.00E 0 / 24.80E 0	4.1 :V	4.7 :V	3 :V	4.6 :V	4.1 :V	5.9 :V	5.9 :V	3.9 :V	4.8 :V	4.8 :V	6 :V	6.3 :V	3.8 :V	5.8 :V	4.4 :V
COPPER	25	1.10E 4 / 27.30E 0	14.6 :V	30.3 :V#	17.4 :V	17.4 :V	15.4 :V	24.1 :V	24.9 :V	17.2 :V			21.1 :V	20.5 :V	24.1 :V	17 :V	
IRON	100	0.00E 0 / 28160.40E 0	11500 :V	12400 :V	8940 :V	13000 :V	11600 :V	13300 :V	15000 :V	11200 :V	12000 :V	11300 :V	16900 :V	13900 :V	9770 :V	12500 :V	11300 :V
LEAD	3	0.00E 0 / 61.40E 0	9.3 :V	33.5 :V	22.5 :V	9.7 :V	10.1 :V	65.8 :V#	42.2 :V	82 :V#	9.1 :V	9 :V	34.2 :V	34.7 :V	18.7 :V	12.1 :V	9 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	2440 :V	1700 :V	1370 :V	2600 :V	2350 :V	2090 :V	2040 :V	1880 :V	2460 :V	2350 :V	2260 :V	2340 :V	2270 :V	2460 :V	2360 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	154 :V	229 :V	137 :V	174 :V	154 :V	294 :V	255 :V	196 :V	169 :V	158 :V	288 :V	287 :V	165 :V	173 :V	164 :V
MERCURY	0.2	8.23E 1 / 0.20E 0		.14 :V	.25 :V#			.067 :V	.21 :V#	.054 :V			.13 :V	.14 :V			
NICKEL	40	5.49E 3 / 26.90E 0								7.1 :V	9 :V	8.3 :V	15.7 :V	15.4 :V	9 :V	8.8 :V	7.8 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	1970 :V	2170 :V	1380 :V	3330 :V	2270 :V	2810 :V	2730 :V	2230 :V	2130 :V	2020 :V	2710 :V	2810 :V	1550 :V	2360 :V	1930 :V
SELENIUM	5	1.37E 3 / 1.40E 0															
SILVER	10	1.37E 3 / 10.00E 0											2.4 :V	2.2 :V	1.1 :V	.95 :V	
SODIUM	5000	0.00E 0 / 1108.00E 0	79.3 :V	54.8 :JA	82 :V	70.2 :V	51.3 :JA	59.9 :JA	114 :V	90.6 :V		76.4 :V					79.1 :V
VANADIUM	50	1.92E 3 / 55.60E 0	17.9 :V	23.5 :V	18.1 :V	20.1 :V	18.4 :V	30.3 :V	28.4 :V	16.5 :V	18.5 :V	18 :V	28.7 :V	29.1 :V	25.2 :V	22.4 :V	17.6 :V
ZINC	20	8.23E 4 / 86.60E 0	35.3 :V	114 :V#	261 :V#	40.4 :V	47.3 :V	288 :V#	150 :V#	100 I:JA#	39.1 I:JA	33.6 I:JA	62.4 :V	63 :V	58.4 :V	47.6 :V	33.4 I:JA

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TABLE 3-15
Surface-Soil Positive Results
OU10 - IHSS 176

Sample Location:			SS009293	SS009393	SS009393	SS009493	SS009593	SS009693	SS009793	SS009893	SS009993	SS010093	SS010193	SS010293	SS010393	SS010493	SS010593
Sample Identification Number:			SSG1175JE	SSG1142JE	SSG1176JE	SSG1177JE	SSG1178JE	SSG1179JE	SSG1180JE	SSG1181JE	SSG1182JE	SSG1183JE	SSG1184JE	SSG1185JE	SSG1186JE	SSG1187JE	SSG1188JE
Date Sampled:			2-Feb-94	9-Feb-94	9-Feb-94	9-Feb-94	10-Feb-94	10-Feb-94	9-Feb-94	9-Feb-94	10-Feb-94	15-Feb-94	15-Feb-94	15-Feb-94	16-Feb-94	16-Feb-94	16-Feb-94
Test Group:SMETCLP Units: mg/kg	MDL	RBC/BKGND															
ALUMINUM	200	0.00E 0 / 21915.40E 0	5740 :V	7280 :V	7020 :V	5890 :V	7440 :V	7100 :V	6660 :V	4120 :V	8310 :V	3090 :V	25600 :V#	17500 :V	12300 :V	10300 :V	15200 :V
ARSENIC	10	3.66E-1 / 12.90E 0	3.7 :V*	4.4 :V*	4.2 :V*	2.1 B:V*	3.7 :V*	3.4 :V*	3.5 :V*	2.3 B:V*	6 :V*	6.2 :V*	11.1 :V*	8.9 :V*	4.1 :V*	5.5 :V*	10.6 :V*
BARIUM	200	1.92E 4 / 528.00E 0	53.1 :V	86.9 :V	73.9 :V	57.3 :V	71.8 :V	52.5 :V	65.7 :V	42.6 B:V	94.7 :V	34.2 B:V	96.2 :V	107 :V	154 :V	125 :V	123 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.43 :V	.57 B:V	.57 B:V	.67 B:V	.62 B:V	.79 B:V	.66 B:V	.45 B:V	.69 B:V		1.7 :V*	1.3 :V	.88 B:V	.91 B:V	1.2 :V
CADMIUM	5	1.37E 2 / 5.00E 0	1.1 :V	2.5 :JA	2.1 :JA	.8 B:JA	4 :JA	10.1 :JA#	4.9 :JA	.69 B:JA	2.8 :JA	.89 B:V	2.2 :V	3 :V	1.2 B:V	10.3 :V#	9.3 :V#
CALCIUM	5000	0.00E 0 / 13573.30E 0	2870 I:JA	8670 I:JA	7740 I:JA	2630 I:JA	3270 I:JA	3500 I:JA	3620 I:JA	9840 I:JA	3460 I:JA	1530 I:JA	8310 :V	25400 :V#	12000 :V	11300 :V	13400 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	11.1 :V	22 :V	14.5 :V	12.2 :V	13.5 :V	15.2 :V	14.6 :V	10.2 :V	14.1 :V	5.9 :V	25.1 :V#	18.2 :V	17.5 :V	24.5 :V	31.5 :V#
COBALT	50	0.00E 0 / 24.80E 0	3.7 :V	4.9 B:V	4.9 B:V	3.9 B:V	4.9 B:V	4.1 B:V	4.2 B:V	2.8 B:V	5.4 B:V	2.3 B:V	13.6 :V	8.4 B:V	5.6 B:V	7.3 B:V	13.2 :V
COPPER	25	1.10E 4 / 27.30E 0		16.2 :V	16.2 :V	12.7 :V	15.2 :V	16.7 :V	15.6 :V		17.8 :V	12.5 :V	12.8 :V	14.1 :V	18.8 :V	19.4 :V	21.1 :V
IRON	100	0.00E 0 / 28160.40E 0	9200 :V	11100 :V	11500 :V	9780 :V	11200 :V	10700 :V	10200 :V	5990 :V	12800 :V	4900 :V	19900 :V	16600 :V	13600 :V	12500 :V	16300 :V
LEAD	3	0.00E 0 / 61.40E 0	12.7 :V	55 :V	20.4 :V	11.6 :V	13.1 :V	15.5 :V	16.9 :V	8 :V	30.4 :V	8 :V	12.6 :V	12.8 :V	21.5 :V	77 :V#	88.8 :V#
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	1660 :V	2350 :V	2340 :V	2030 :V	2070 :V	1940 :V	1910 :V	1300 :V	1970 :V	759 B:V	2730 :V	2780 :V	3320 :V	2680 :V	2320 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	164 :V	178 :V	172 :V	137 :V	204 :V	172 :V	181 :V	97.6 :V	265 :V	69.1 :V	153 :JA	338 :JA	145 :JA	311 :JA	369 :JA
MERCURY	0.2	8.23E 1 / 0.20E 0			.081 B:V			.05 B:V					.12 :V	.08 :V		.07 :V	.2 :V#
NICKEL	40	5.49E 3 / 26.90E 0	8 :V	9.3 :V	8.6 :V	8 B:V	8.5 B:V	8.6 :V	7.7 B:V	6.2 B:V	9.4 :V	3.9 B:V	20.2 :V	19.5 :V	9.6 B:V	10.6 :V	16.7 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	1720 :V	2030 :V	1960 :V	1710 :V	2540 :V	2410 :V	2160 :V	877 B:V	2400 :V	840 B:V	2300 :V	2280 :V	1960 :V	2740 :V	2880 :V
SELENIUM	5	1.37E 3 / 1.40E 0											1.3 :JA	.89 B:V	.75 B:V	.61 B:V	1.2 B:V
SILVER	10	1.37E 3 / 10.00E 0											.73 B:V		.53 B:V	1.6 B:V	1.6 B:V
SODIUM	5000	0.00E 0 / 1108.00E 0						154 B:V				24.6 B:V					
VANADIUM	50	1.92E 3 / 55.60E 0	17.1 :V	19.8 :V	20 :V	17 :V	20.3 :V	19 :V	18.6 :V	11.8 B:V	24 :V	12 :V	51.5 :V	39.9 :V	31 :V	27.5 :V	39.9 :V
ZINC	20	8.23E 4 / 86.60E 0	50.7 I:JA	80.9 :V	70.1 :V	64.6 :V	48.4 :V	44.3 :V	45.8 :V	23.7 :V	80.5 :V	31.3 :JA	46.3 :JA	35.7 :V	99.2 :V#	199 :V#	204 :V#

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BKGND = Background concentration (DOE 1994c)
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
RBC = Risk-Based Concentration
V = Validation Qualifier: valid data

µg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
** = All samples reported with positive results; no nondetects reported
# = Indicates compound exceeds background
- = There is no RBC for that compound

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TABLE 3-16

Surface-Soil Positive Results Data Summary

OU10 - IHSS 176

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
Test Group:BNACLP Units: µg/kg												
2-METHYLNAPHTHALENE	330	350	SS007893 (4)	470	SS010393 (1)	39 J:A	SS009993 (1)	39 J:A	SS009993 (1)	1	28	184.9643
4-CHLORO-3-METHYLPHENOL	330	350	SS007893 (4)	470	SS010393 (1)	60 J:A	SS010093 (1)	60 J:A	SS010093 (1)	1	28	186.25
4-METHYLPHENOL	330	350	SS007893 (4)	470	SS010393 (1)	190 J:A	SS008093 (1)	190 J:A	SS008093 (1)	1	28	189.8214
ACENAPHTHENE	330	350	SS007893 (4)	470	SS010393 (1)	47 J:A	SS009493 (1)	470 :V	SS009993 (1)	5	28	187.3214
ANTHRACENE	330	350	SS007893 (4)	470	SS010393 (1)	37 J:A	SS008593 (1)	670 :V	SS009993 (1)	6	28	195.2143
BENZO(a)ANTHRACENE	330	350	SS008693 (2)	470	SS010393 (1)	50 J:A	SS007893 (2)	1800 :V	SS009993 (1)	15	28	238.6071
BENZO(a)PYRENE	330	350	SS007893 (2)	470	SS010393 (1)	36 J:A	SS009693 (1)	1700 :V	SS009993 (1)	18	28	226.8571
BENZO(b)FLUORANTHENE	330	350	SS008693 (1)	470	SS010393 (1)	50 J:A	SS009593 (1)	2400 :V	SS009993 (1)	19	28	284.8929
BENZO(ghi)PERYLENE	330	350	SS007893 (4)	470	SS010393 (1)	58 J:A	SS010093 (1)	240 J:A	SS009993 (1)	3	28	184.0357
BENZO(k)FLUORANTHENE	330	350	SS007893 (4)	470	SS010393 (1)	58 J:A	SS009493 (1)	770 :V	SS009993 (1)	9	28	196.5357
BENZOIC ACID	1600	1700	SS007893 (9)	2000	SS008093 (1)	52 J:A	SS008893 (1)	52 J:A	SS008893 (1)	1	25	868.08
BIS(2-ETHYLHEXYL) PHTHALATE	330	350	SS007893 (3)	460	SS010193 (1)	430 :V	SS010093 (1)	9400 BD:J	SS010593 (1)	7	28	1129.286
BUTYL BENZYL PHTHALATE	330	350	SS007893 (3)	470	SS010393 (1)	38 J:A	SS009393 (1)	90 J:A	SS008393 (1)	2	28	181.8929
CHRYSENE	330	350	SS008693 (1)	470	SS010393 (1)	43 J:A	SS009593 (1)	1800 :V	SS009993 (1)	16	28	231.9643
DI-n-BUTYL PHTHALATE	330	350	SS007893 (4)	470	SS010393 (1)	55 J:A	SS008893 (1)	57 J:A	SS008993 (1)	2	28	180.4286
DI-n-OCTYL PHTHALATE	330	350	SS007893 (4)	470	SS010393 (1)	42 J:A	SS009293 (1)	72 J:A	SS008393 (1)	2	28	181.0357
DIBENZO(a,h)ANTHRACENE	330	350	SS007893 (4)	470	SS010393 (1)	52 J:A	SS009293 (1)	240 J:A	SS009993 (1)	3	28	183.0357
DIBENZOFURAN	330	350	SS007893 (4)	470	SS010393 (1)	58 J:A	SS009293 (1)	170 J:A	SS009993 (1)	2	28	185.1071
DIMETHYL PHTHALATE	330	350	SS007893 (3)	470	SS010393 (1)	250 J:A	SS009693 (1)	250 J:A	SS009693 (1)	1	28	193.2143
FLUORANTHENE	330	360	SS009193 (1)	380	SS010293 (1)	46 J:A	SS008693 (1)	4600 D:V	SS009993 (1)	25	28	426.1429
FLUORENE	330	350	SS007893 (4)	470	SS010393 (1)	45 J:A	SS010593 (1)	390 :V	SS009993 (1)	4	28	187.25
INDENO(1,2,3-cd)PYRENE	330	350	SS007893 (3)	470	SS010393 (1)	40 J:A	SS009593 (1)	1000 :V	SS009993 (1)	12	28	189.6786
NAPHTHALENE	330	350	SS007893 (4)	470	SS010393 (1)	56 J:A	SS009293 (1)	150 J:A	SS009993 (1)	2	28	184.3214
PENTACHLOROPHENOL	1600	1700	SS007893 (9)	2300	SS010393 (1)	50 J:A	SS008893 (1)	50 J:A	SS008893 (1)	1	28	887.5
PHENANTHRENE	330	350	SS008693 (1)	470	SS010393 (1)	52 J:A	SS009593 (1)	3300 D:V	SS009993 (1)	21	28	332.4643
PYRENE	330	350	SS007893 (3)	470	SS010393 (1)	42 J:A	SS008693 (1)	3500 BD:V	SS009993 (1)	10	28	403.6429
Test Group:METADD Units: mg/kg												
CESIUM	1000	2.9	SS010093 (1)	13.3	SS009093 (1)	4 :V	SS008693 (1)	18.8 :V	SS008493 (1)	6	16	6.0781
LITHIUM	100	**	**	**	**	3 B:J	SS010093 (1)	18.4 B:J	SS010593 (1)	28	28	9.3464
MOLYBDENUM	200	0.55	SS010193 (1)	3.7	SS008793 (2)	5.8 :V	SS008593 (1)	5.8 :V	SS008593 (1)	1	28	1.3684
STRONTIUM	200	**	**	**	**	7.9 B:J	SS010093 (1)	68.4 :J	SS010393 (1)	28	28	20.3929
TIN	200	1.6	SS008693 (1)	2.8	SS008993 (1)	2 :V	SS007993 (1)	2 :V	SS007993 (1)	1	28	0.9804
Test Group:PESTCLP Units: µg/kg												
AROCLOR-1254	160	170	SS007893 (8)	220	SS010193 (1)	210 :V	SS008493 (1)	8900 C:J	SS010593 (1)	6	28	636.6071
AROCLOR-1260	160	170	SS007893 (8)	1800	SS010493 (1)	310 :V	SS009393 (1)	310 :V	SS009393 (1)	1	27	130
Test Group:SMETCLP Units: mg/kg												
ALUMINUM	200	**	**	**	**	3090 :V	SS010093 (1)	25600 :V	SS010193 (1)	28	28	8787.857
ARSENIC	10	**	**	**	**	2.1 B:V	SS009493 (1)	34.4 :V	SS008893 (1)	28	28	7.4286
BARIUM	200	**	**	**	**	34.2 B:V	SS010093 (1)	154 :V	SS010393 (1)	28	28	81.2857
BERYLLIUM	5	0.28	SS010093 (1)	0.38	SS008193 (1)	.33 :J	SS009093 (1)	2.1 :V	SS008493 (1)	24	28	0.7023
CADMIUM	5	0.36	SS007893 (1)	0.36	SS007893 (1)	.5 :J	SS008193 (1)	14 :J	SS008493 (1)	27	28	4.0754
CALCIUM	5000	**	**	**	**	1510 I:J	SS008793 (1)	25400 :V	SS010293 (1)	28	28	6035
CHROMIUM	10	**	**	**	**	5.9 :V	SS010093 (1)	31.5 :V	SS010593 (1)	28	28	16.3929
COBALT	50	**	**	**	**	2.3 B:V	SS010093 (1)	13.6 :V	SS010193 (1)	28	28	5.3714
COPPER	25	7.8	SS009893 (1)	15.4	SS008693 (1)	12.5 :V	SS010093 (1)	30.3 :V	SS007993 (1)	23	28	16.0411
IRON	100	**	**	**	**	4900 :V	SS010093 (1)	19900 :V	SS010193 (1)	28	28	11995.71
LEAD	3	**	**	**	**	8 :V	SS009893 (2)	88.8 :V	SS010593 (1)	28	28	26.8429
MAGNESIUM	5000	**	**	**	**	759 B:V	SS010093 (1)	3320 :V	SS010393 (1)	28	28	2161.75
MANGANESE	15	**	**	**	**	69.1 :V	SS010093 (1)	369 :J	SS010593 (1)	28	28	196.2036
MERCURY	0.2	0.05	SS010093 (1)	0.07	SS010393 (1)	.05 B:V	SS009693 (1)	.25 :V	SS008093 (1)	12	28	0.0677

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TABLE 3-16
Surface-Soil Positive Results Data Summary
OU10 - IHSS 176

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
NICKEL	40	7.7	SS008293 (1)	12.7	SS008493 (1)	3.9 B:V	SS010093 (1)	20.2 :V	SS010193 (1)	21	28	8.7929
POTASSIUM	5000	**	**	**	**	840 B:V	SS010093 (1)	3330 :V	SS008193 (1)	28	28	2162.036
SELENIUM	5	0.55	SS008693 (1)	0.73	SS008093 (1)	.61 B:V	SS010493 (1)	1.3 :J	SS010193 (1)	5	28	0.4246
SILVER	10	0.46	SS008293 (1)	2.2	SS007993 (1)	.53 B:V	SS010393 (1)	2.4 :V	SS008893 (1)	7	28	0.7171
SODIUM	5000	49.7	SS008893 (1)	282	SS010293 (1)	24.6 B:V	SS010093 (1)	154 B:V	SS009693 (1)	12	28	73.6018
VANADIUM	50	**	**	**	**	11.8 B:V	SS009893 (1)	51.5 :V	SS010193 (1)	28	28	23.3429
ZINC	20	**	**	**	**	23.7 :V	SS009893 (1)	288 :V	SS008393 (1)	28	28	84.4821

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
G = Native analyte greater than four times spike added — inorganics
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
SQL = Sample Quantitation Limit
V = Validation Qualifier: valid data
µg/kg = microgram per kilogram
* = The number of sample locations at that value is shown in parentheses
** = All samples reported with positive results; no nondetects reported

benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. The highest concentrations of PAHs were found at SS009993 east of the site beyond the outer limits of the storage yard and within IHSS 165. Although PAHs were detected throughout the site, only benzo(a)pyrene exceeded the risk level within the IHSS boundaries; this occurred at seven locations. The other PAHs exceeded the risk levels only at SS009993 or SS009293, located east of the IHSS boundary. PAHs were also detected north of the IHSS in the northern portion of the storage yard.

PCBs, in the form of Aroclor-1254 or -1260, were detected at six locations: four along the northern IHSS boundary (SS010393 through SS010593 and SS009393), at one location (SS008493) along the western boundary, and at SS009993 east of the storage yard (Plate 10). All reported concentrations for the PCBs exceeded the RBCs. Aroclor-1260 was detected only once, at SS009393.

Inorganics exceeding background at one or more locations were aluminum, arsenic, cadmium, calcium, chromium, lead, mercury, vanadium, and zinc (Plate 10). However, levels of cadmium, chromium, mercury, vanadium, and zinc were below RBCs. Arsenic exceeded the RBC at SS008893, SS008393, and SS008493 in the southwestern portion of the sampled area. RBC concentrations were not available for aluminum or lead.

It is important to note that IHSS 176 is overlapped by IHSS 165, which is part of OU6. Data are available from IHSS 165 1992/1993 soil investigations and have been included in Appendix B. However, because samples collected from IHSS 165 were part of a different sampling event and analytical data could not be directly correlated to data from IHSS 176, these data were not combined with the IHSS 176 data. Of interest in IHSS 165 data are additional detections of PCBs northeast of IHSS 176. Data were not available for the BNAs; therefore, additional characterization of PAHs east of IHSS 176 could not be conducted.

3.6.3 Soil-Gas Survey

The soil-gas survey was conducted on a 40-foot triangular grid. One-hundred-seventy-eight (178) soil-gas locations were sampled. Figure 3-11 presents soil-gas sample locations for IHSS 176.

Concentrations of target VOCs equal to or exceeding the target detection limit of 1.0 μg/L (see Section 3.1.3) are listed in Table 3-17. Concentrations greater than 1.0 μg/L are present on the eastern, northern, and western sides of the storage yard. These elevated concentrations are presented on Plate 11.

Acetone was observed at two locations on the northeastern corner of the IHSS 176 boundary. A maximum of 1.65 μg/L was observed at SG060394, and a minimum of 1.20 μg/L was observed at SG060294.

Concentrations exceeding the target detection limit are present outside the IHSS boundary on the eastern side of the storage yard along the roadway. Benzene was observed at four locations. A maximum concentration of benzene, 1.40 μg/L, was observed at site SG061994. A minimum concentration of benzene, 1.06 μg/L, was observed at location SG063094.

Toluene was also observed at two locations on the eastern side of the storage yard. A maximum concentration of 1.69 μg/L was present at SG060694, and a minimum concentration of 1.01 μg/L was present at SG069194.

Benzene and toluene were observed at one location outside the IHSS boundary on the western side of IHSS 176. This occurrence is also next to a roadway through the storage yard. Benzene was observed in a concentration of 1.11 μg/L, and toluene was present at a concentration of 1.83.

TABLE 3-17
Target Analytes for OU10 - IHSS 176
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

LOCATION NUMBER	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG053094	SGG0530JE	8/4/94	REAL	Methane	10.00	ppm		20.00
SG054894	SGG0548JE	6/29/94	REAL	Methane	20.00	ppm		20.00
SG055094	SGG0550JE	6/29/94	REAL	Methane	90.00	ppm		20.00
SG055394	SGG0553JE	9/8/94	REAL	Methane	10.00	ppm		20.00
SG055694	SGG0556JE	8/18/94	REAL	Methane	30.00	ppm		20.00
SG056494	SGG0458JE	8/18/94	REAL	Methane	30.00	ppm		20.00
	SGG0564JE	7/19/94	REAL	Acetone	1.90	µg/L		0.03
SG056594	SGG0565JE	8/04/94	REAL	Methane	10.00	ppm		20.00
SG056894	SGG0568JE	8/04/94	REAL	Methane	20.00	ppm		20.00
SG058494	SGG0584JE	6/27/94	REAL	Methane	60.00	ppm		20.00
SG058994	SGG0589JE	6/16/94	REAL	Methane	20.00	ppm		20.00
SG059194	SGG0591JE	8/04/94	REAL	Methane	50.00	ppm		20.00
SG059394	SGG0593JE	6/16/94	REAL	Methane	40.00	ppm		20.00
SG059494	SGG0594JE	6/16/94	REAL	Benzene	1.18	µg/L	B	0.18
				Methane	30.00	ppm		20.00
SG059594	SGG0595JE	6/16/94	REAL	Methane	20.00	ppm		20.00
SG060194	SGG0601JE	7/28/94	REAL	Methane	30.00	ppm		20.00
SG060294	SGG0457JE	8/18/94	REAL	Acetone	1.20	µg/L		0.06
				Methane	90.00	ppm		20.00
SG060394	SGG0603JE	7/18/94	REAL	Acetone	1.65	µg/L		0.03
SG060694	SGG0606JE	6/16/94	REAL	Toluene	1.69	µg/L		0.11
SG060794	SGG0607JE	6/16/94	REAL	Methane	20.00	ppm		20.00
SG061194	SGG0611JE	7/28/94	REAL	Total Xylenes	1.41	ppm		0.01
SG061694	SGG0616JE	6/15/94	REAL	Methane	20.00	ppm		20.00
SG061994	SGG0619JE	6/15/94	REAL	Benzene	1.40	µg/L	B	0.06
				Methane	20.00	ppm		20.00
SG062294	SGG0622JE	6/16/94	REAL	Methane	10.00	ppm		20.00
SG062394	SGG0623JE	6/16/94	REAL	Methane	20.00	ppm		20.00

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TABLE 3-17
Target Analytes for OU10 - IHSS 176
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

LOCATION NUMBER	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG062494	SGG0624JE	6/16/94	REAL	Methane	10.00	ppm		20.00
SG062594	SGG0625JE	7/28/94	REAL	Methane	40.00	ppm		20.00
SG062794	SGG0627JE	6/15/94	REAL	Methane	10.00	ppm		20.00
SG062894	SGG0628JE	6/15/94	REAL	Methane	20.00	ppm		20.00
SG062994	SGG0629JE	6/14/94	REAL	Methane	20.00	ppm		20.00
SG063094	SGG0630JE	6/14/94	REAL	Benzene	1.06	µg/L		0.03
				Methane	20.00	ppm		20.00
SG063194	SGG0631JE	6/14/94	REAL	Methane	20.00	ppm		20.00
SG063294	SGG0632JE	6/23/94	REAL	Benzene	1.11	µg/L	B	0.18
				Toluene	1.83	µg/L		0.11
				Total Xylenes	1.49	ppm		0.20
SG063394	SGG0633JE	6/23/94	REAL	Methane	20.00	ppm		20.00
SG063794	SGG0637JE	6/24/94	REAL	Methane	20.00	ppm		20.00
SG063894	SGG0638JE	6/14/94	REAL	Methane	50.00	ppm		20.00
SG064094	SGG0640JE	6/14/94	REAL	Methane	70.00	ppm		20.00
SG064394	SGG0643JE	6/14/94	REAL	Methane	30.00	ppm		20.00
SG064794	SGG0647JE	6/27/94	REAL	Methane	20.00	ppm		20.00
SG065094	SGG0650JE	6/13/94	REAL	Methane	20.00	ppm		20.00
SG065294	SGG0652JE	6/13/94	REAL	Methane	50.00	ppm		20.00
SG065394	SGG0653JE	6/10/94	REAL	Methane	90.00	ppm		20.00
SG065494	SGG0654JE	6/10/94	REAL	Methane	50.00	ppm		20.00
SG065694	SGG0656JE	7/26/94	REAL	Methane	20.00	ppm		20.00
SG065894	SGG0658JE	6/24/94	REAL	Methane	10.00	ppm		20.00
SG066194	SGG0459JE	8/18/94	REAL	Methane	30.00	ppm		20.00
	SGG0661JE	7/27/94	REAL	Methane	30.00	ppm		20.00
SG066294	SGG0662JE	7/27/94	REAL	Methane	50.00	ppm		20.00
SG066394	SGG0663JE	6/13/94	REAL	Methane	50.00	ppm		20.00
SG066494	SGG0664JE	6/13/94	REAL	Methane	20.00	ppm		20.00
SG066594	SGG0665JE	6/13/94	REAL	Methane	20.00	ppm		20.00
SG066694	SGG0666JE	6/10/94	REAL	Methane	20.00	ppm		20.00

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TABLE 3-17
Target Analytes for OU10 - IHSS 176
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

LOCATION NUMBER	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG066994	SGG0669JE	7/20/94	REAL	Tetrachloroethene	1.70	µg/L		0.02
SG067394	SGG0673JE	6/10/94	REAL	Methane	20.00	ppm		20.00
SG067494	SGG0674JE	7/28/94	REAL	Methane	10.00	ppm		20.00
SG067594	SGG0675JE	6/10/94	REAL	Methane	20.00	ppm		20.00
SG067694	SGG0676JE	6/10/94	REAL	Methane	40.00	ppm		20.00
SG067794	SGG0677JE	6/10/94	REAL	Methane	30.00	ppm		20.00
SG067894	SGG0678JE	6/10/94	REAL	Methane	30.00	ppm		20.00
SG068094	SGG0680JE	6/23/94	REAL	Methane	10.00	ppm		20.00
SG068294	SGG0682JE	6/24/94	REAL	Methane	20.00	ppm		20.00
SG068494	SGG0684JE	6/24/94	REAL	Methane	20.00	ppm		20.00
SG068594	SGG0685JE	6/10/94	REAL	Methane	20.00	ppm		20.00
SG068694	SGG0686JE	6/10/94	REAL	Methane	20.00	ppm		20.00
SG068894	SGG0688JE	6/9/94	REAL	Methane	60.00	ppm		20.00
SG068994	SGG0689JE	6/9/94	REAL	Methane	60.00	ppm		20.00
SG069194	SGG0691JE	6/8/94	REAL	Benzene	1.11	µg/L		0.03
				Toluene	1.01	µg/L		0.11
				Methane	30.00	ppm		20.00
SG069294	SGG0692JE	7/27/94	REAL	Methane	20.00	ppm		20.00
SG069494	SGG0694JE	6/24/94	REAL	Methane	10.00	ppm		20.00
SG069894	SGG0698JE	6/8/94	REAL	Methane	40.00	ppm		20.00
SG070094	SGG0700JE	6/8/94	REAL	Methane	90.00	ppm		20.00
SG070194	SGG0701JE	6/8/94	REAL	Methane	80.00	ppm		20.00
SG070294	SGG0702JE	6/8/94	REAL	Methane	20.00	ppm		20.00
SG070694	SGG0706JE	6/24/94	REAL	Methane	10.00	ppm		20.00
SG070994	SGG0709JE	6/9/94	REAL	Methane	20.00	ppm		20.00
SG071194	SGG0711JE	6/9/94	REAL	Methane	20.00	ppm		20.00
SG071294	SGG0712JE	6/9/94	REAL	Methane	60.00	ppm		20.00

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TABLE 3-17
Target Analytes for OU10 - IHSS 176
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

LOCATION NUMBER	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG071394	SGG0713JE	6/9/94	REAL	Methane	90.00	ppm		20.00
SG071494	SGG0714JE	6/9/94	REAL	Methane	80.00	ppm		20.00
SG071594	SGG0715JE	6/9/94	REAL	Methane	20.00	ppm		20.00

Notes:

1) The target detection level of 1.0 µg/L applies to the following chemicals of concern: 1,1,1-trichloroethane, 2-butanone, acetone, benzene, carbon tetrachloride, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, cis-1,2-dichloroethene, and xylenes.

The field instrument detection level for hydrogen sulfide is 5 ppm.
The field instrument detection level for methane is 20 ppm.
Reported values of 10 ppm are estimated (see Section 3.1.3).

2) B = analyte detected in blank

REAL = environmental sample
ppm = parts per million
µg/L = micrograms per liter

μg/L at site SG063294. Also on the western side inside the IHSS 176 boundary, PCE was detected in a concentration of 1.70 μg/L at location number SG066994.

Outside the boundary on the northern side of IHSS 176, acetone was observed at one location. Acetone was present in a concentration of 1.90 μg/L at SG056494.

A soil-gas survey was also conducted at OU6 IHSS 165. The overlap of IHSSs 165 and 176 is presented on Figure 3-11. Nine compounds were targeted for this soil-gas study: acetone, methylene chloride, 2-butanone, chloroform, carbon tetrachloride, 1,2-dichloroethene (1,2-DCE), TCE, toluene, and PCE. No analytes were present above detection limits in the area of overlap with IHSS 176. Copies of the soil-gas results for IHSS 165 are included in Table C-3 of Appendix C of this report.

Methane was detected at 73 soil-gas locations in IHSS 176. A minimum concentration of 10 ppm was observed at 11 locations, and a maximum concentration of 90 ppm was observed at five locations.

Winds from the solar ponds to the west of the storage yard often carry water spray to the storage yard. Added moisture from the pond spray could explain the increased occurrence of low-level methane from accelerated organic decay in this IHSS. When compared to the landfill of OU7 (DOE 1994d), low levels of methane observed at IHSS 176 are within the range of methane produced from naturally occurring organic material.

3.7 IHSS 177 - BUILDING 885 - DRUM STORAGE AREA

Building 885 Drum Storage Area consists of the eastern and western sections of Building 885. Each of the two drum storage areas is covered by a roof. The eastern portion is enclosed on two sides and the western portion is enclosed on three sides. The floors are constructed of concrete and each floor is approximately 10 by 20 feet.

The drum storage area has been used since 1953. Since 1986, the areas have been used as a 90-day accumulation area and as a satellite collection station. The western section of Building 885 was used to store unused and waste oils. The eastern section stored unused paint, waste paint, and paint solvents. Waste material also contained low-level radioactive wastes. A maximum of ten to twenty 55-gallon drums were stored on pallets on the concrete floors in each area. There are no berms around the storage areas. Only one drum in each section was used for waste storage; the remaining drums contained unused oils and solvents. The total container storage capacity was 1,100 gallons. There have been no documented spills or leaks in this area (DOE 1992a).

As part of an initial soil characterization program, four soil samples were collected from 1-foot deep test pits below a 6-inch asphalt layer; these samples were analyzed in 1988. Analysis of soil samples taken from locations surrounding IHSS 177 indicated detection of organics including acetone, 2-butanone, and trans-1,2-dichloroethene. Metals and inorganics detected include aluminum, arsenic, beryllium, chromium, strontium, manganese, barium, calcium, cadmium, copper, lead, iron, magnesium, mercury, vanadium, zinc, potassium, and nitrate/nitrite. Radionuclides detected include gross alpha; gross beta; tritium; uranium-238; uranium-233 and -234; plutonium-239 and -240; and americium-241.

Analysis of groundwater samples taken from an upgradient well (Well 527) indicated detection of metals and other inorganics including aluminum, calcium, copper, magnesium, manganese, nickel, sodium, zinc, and sulfate. Radionuclides detected at the well include americium-241; gross alpha; plutonium 239; uranium-233, -234; -238; and tritium. Downgradient data (Well 537) indicated detection of calcium, copper, magnesium, nickel, sodium, zinc, and sulfate. The radionuclides detected include uranium-233 and uranium-234. Detailed information on the analyses and sampled locations can be found in the OU10 *RFI/RI Work Plan* (DOE 1992a).

3.7.1 High Purity Germanium Survey

The HPGe survey data for the two survey locations within IHSS 177 provided no evidence to indicate anomalous activities for potassium-40, radium-226, thorium-232, uranium-235, uranium-238, americium-241, or plutonium-239 at IHSS 177. The activities identified at IHSS 177 fell within the expected range of background values presented in Table 3-1 for all of the above isotopes. These results were further supported by the NaI detector work before surface-soil and soil-gas sample collection. HPGe locations for IHSS 177 are illustrated on Plate 1, the Americium Specific Activity Map.

3.7.2 Surface-Soil Sampling

At the time of document preparation, the surface-soil data for IHSS 177 were not completely validated. The analytical data were examined to best identify positive detections or nondetects within the nonvalidated portion. Ten sample locations were sampled around the Building 885 Drum Storage Area, including collection of one duplicate sample at SS013393. Sample locations are shown in Figure 3-12.

Most of the surface-soil samples were collected beneath an asphalt layer in the area of the site. Two locations were sampled outside the fence surrounding the site (SS013493 and SS013793) in a low-lying ditch along the fenceline. SS013493 is situated directly south of the center of the site, and SS013793 lies near the southeast corner of the IHSS.

Complete surface-soil analytical results are included in Appendix B. Detected constituents and their concentrations are given in Table 3-18. Table 3-19 summarizes the analytical results. As seen in the analytical results tables, 19 organics and 24 inorganics were detected in surface-soil at IHSS 177. Organics detected were mostly PAHs. Benzoic acid and several phthalate compounds were also detected at several sample locations. Plate 12 shows the positive analytical results at the sampled locations.

As shown on Plate 12, organic constituents were detected at nearly every sample location. The greatest number and highest concentrations of PAHs were found at the two locations along the fenceline that are situated outside the asphalt layer. These locations also have concentrations of benzo(b)flouranthene, benzo(a)pyrene and benzo(a)anthracene above the RBC. No other analytes were detected above background and their associated RBC, although several inorganics were detected above background including calcium, chromium, copper, lead, strontium, and zinc. Benzo(g,h,i)perylene, 2-methylnaphthalene, phenanthrene, and lead do not have RBCs and could not be evaluated in the quantitative comparison.

3.7.3 Soil-Gas Survey

Sixteen locations were sampled for soil gas on a 20-foot grid. Figure 3-13 presents soil-gas locations for IHSS 177.

Concentrations of target VOCs equal to or exceeding the target detection limit of 1.0 μg/L (Section 3.1.3) are listed in Table 3-20. All 16 locations exhibited VOCs present in concentrations above target detection limits. (Refer to Plate 13.) Sample points with the three highest concentrations of VOCs are southeast, south, and southwest of the IHSS.

The highest concentrations of target analytes on the south of IHSS 177 are present at location SG074494. At this sample site, PCE is present in a concentration of 1100.00 μg/L, TCE in

TABLE 3-18
Surface-Soil Positive Results
OU10 - IHSS 177

Sample Location:			SS012893	SS012993	SS013093	SS013193	SS013293	SS013393	SS013393	SS013493	SS013593	SS013693	SS013793
Sample Identification Number:			SSG1211JE	SSG1212JE	SSG1213JE	SSG1214JE	SSG1215JE	SSG1216JE	SSG1304JE	SSG1217JE	SSG1218JE	SSG1219JE	SSG1220JE
Date Sampled:			22-Jul-94	25-Jul-94	25-Jul-94	25-Jul-94	26-Jul-94	26-Jul-94	26-Jul-94	28-Jul-94	26-Jul-94	26-Jul-94	28-Jul-94
Test Group:BNACLP Units:µg/kg	MDL	RBC / BKGND											
2-METHYLNAPHTHALENE	330	0.00E 0 / 0.00E 0											57 J:?-
ACENAPHTHENE	330	1.65E 7 / 0.00E 0								74 J:?			410 :?
ANTHRACENE	330	8.23E 7 / 0.00E 0								110 J:?			410 :?
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0		63 J:?						310 J:?			950 :?*
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0		60 J:?						390 :?*			
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0		73 J:?						700 :?			1800 BD:?*
BENZO(ghi)PERYLENE	330	0.00E 0 / 0.00E 0								170 J:?-			990 :?-
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0											610 :?
BENZOIC ACID	1600	1.10E 9 / 0.00E 0									44 J:?		77 J:?
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0	64 J:?		55 J:?		58 J:?	62 J:?	42 J:?	140 J:?			420 :?
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0											120 J:?
CHRYSENE	330	8.77E 4 / 0.00E 0		69 J:?						410 :?			1200 :?
DI-n-BUTYL PHTHALATE	330	2.74E 7 / 0.00E 0								48 J:?			110 J:?
DIBENZOFURAN	330	0.00E 0 / 0.00E 0											160 J:?-
FLUORANTHENE	330	1.10E 7 / 0.00E 0		150 J:?			49 J:?			690 :?			2700 BD:?
FLUORENE	330	1.10E 7 / 0.00E 0								53 J:?			330 J:?
NAPHTHALENE	330	1.10E 7 / 0.00E 0											84 J:?
PHENANTHRENE	330	0.00E 0 / 0.00E 0		89 J:?-					47 J:?-	580 :?-	43 J:?-	49 J:?-	2200 :?-
PYRENE	330	8.23E 6 / 0.00E 0		120 J:?	41 J:?		59 J:?			1200 :?	82 J:?	58 J:?	3000 BD:?
Test Group:METADD Units:mg/kg													
CESIUM	1000	0.00E 0 / 630.80E 0	4.8 :?										
LITHIUM	100	0.00E 0 / 20.00E 0	4.3 :?	6.1 B:JA	6.8 B:JA	5.3 B:JA	8.3 B:JA	7.9 B:JA	7.1 B:JA	5.5 B:JA	6.6 B:JA	7.7 B:JA	8.1 B:JA
MOLYBDENUM	200	9.64E 0 / 40.00E 0	2.5 :?										5 B:V
STRONTIUM	200	1.65E 5 / 90.10E 0	63.6 :?	76.5 :JA	27.9 B:JA	75.1 :JA	123 :JA#	136 :JA#	140 :JA#	36.3 B:JA	127 :JA#	150 :JA#	63.3 :JA
Test Group:SMETCLP Units:mg/kg													
ALUMINUM	200	0.00E 0 / 21915.40E 0	8460 :?	9870 :V	6200 :V	9850 :V	10200 :V	9780 :V	8550 :V	6940 :V	8960 :V	8810 :V	9940 :V
ARSENIC	10	3.66E-1 / 12.90E 0	3 :?*	6.9 :V*	2.1 :V*	3 :V*	4.8 :V*	7.3 :V*	6.3 :V*	4.2 :V*	6.6 :V*	5.8 :V*	5.8 :V*
BARIUM	200	1.92E 4 / 528.00E 0	154 :?	464 :V	55.4 :V	225 :V	140 :V	196 :V	183 :V	97.3 :V	190 :V	206 :V	223 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.64 :?	.81 B:V	.19 B:V	.78 B:V	.57 B:V	.57 B:V	.54 B:V	.43 B:V	.66 B:V	.57 B:V	.57 B:V
CALCIUM	5000	0.00E 0 / 13573.30E 0	5580 :?	9120 :V	4400 :V	12300 :V	50600 :V#	61700 :V#	64500 :V#	7410 :V	48000 :V#	69700 :V#	23900 :V#
CHROMIUM	10	9.62E 2 / 24.80E 0	9.1 :?	11.1 :V	7.3 :V	9.9 :V	9.7 :V	10 :JA	8.5 :JA	13.2 :V	8.7 :V	8.4 :JA	43 :V#
COBALT	50	0.00E 0 / 24.80E 0	4 :?	7.3 B:V	6.1 B:V	5 B:V	7.6 B:V	8.1 B:V	7.1 B:V	6 B:V	8.2 B:V	7.3 B:V	11.1 :V
COPPER	25	1.10E 4 / 27.30E 0	15.6 :?	19.1 :V	26.6 :V	16 :V	28.9 :V#	14.1 :JA	13.4 :JA	23.2 :V	14.6 :V	12.1 :JA	31.2 :V#
IRON	100	0.00E 0 / 28160.40E 0	8460 :?	13700 :V	12400 :V	13300 :V	14600 :V	11400 :V	10000 :V	11900 :V	10600 :V	9230 :V	15000 :V
LEAD	3	0.00E 0 / 61.40E 0	16.7 :?	19.1 :V	8.9 :V	19.5 :V	12.7 :V	15.1 :V	13.3 :V	37.5 :V	14.5 :V	12.7 :V	101 :V#
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	2120 :?	2560 :V	3940 :V	2750 :V	5390 :V	3440 :V	3270 :V	3230 :V	3170 :V	3360 :V	3040 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	190 :?	161 :V	259 :V	228 :V	306 :V	204 :V	184 :V	228 :V	139 :V	224 :V	317 :V
MERCURY	0.2	8.23E 1 / 0.20E 0	.066 :?	.068 B:V		.062 B:V							.15 :V
NICKEL	40	5.49E 3 / 26.90E 0	7 :?	13.8 :V	7.8 B:V	12.1 :V	13.1 :V	11.9 :V	11 :V	10.8 :V	9.9 :V	10.1 :V	20.1 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	948 :?	950 B:V	1670 :V	736 B:V	1310 :V	1170 :V	1060 B:V	1390 :V	946 B:V	1020 B:V	1960 :V
SELENIUM	5	1.37E 3 / 1.40E 0		.86 B:JA		.86 B:JA	.75 B:JA	.77 B:JA	.78 B:JA				.72 B:JA
SILVER	10	1.37E 3 / 10.00E 0	1.2 :?	1.5 B:JA	1.4 B:JA	1.4 B:JA				1.9 B:JA			1.8 B:JA
SODIUM	5000	0.00E 0 / 1108.00E 0	183 :?	216 B:V	417 B:V	270 B:V	442 B:V	140 B:JA	136 B:JA	474 B:V	125 B:V	130 B:JA	98.9 B:V
VANADIUM	50	1.92E 3 / 55.60E 0	21.1 :?	28.8 :V	19.2 :V	27.2 :V	32.2 :V	29.1 :V	23.9 :V	23.9 :V	24.7 :V	25.6 :V	29 :V
ZINC	20	8.23E 4 / 86.60E 0	31.2 :?	57.1 :V	47.8 :V	42.2 :V	54.2 :V	65.5 :V	79.5 :V	333 :V#	42.1 :V	33.9 :JA	376 :V#

Notes:

A = Validation Qualifier: laboratory qualifer considered acceptable
B = Laboratory Qualifer: detected in blank
BKGND = Background concentraiton (DOE 1994c)
J = Laboratory Qaulifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
RBC = Risk-Based Concentration
V = Validation Qualifer: valid data

µg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
** = All samples reported with positive results; no nondetects reported
# = Indicates compound exceeds background RBC
- = There is no RBC for that compound

TABLE 3-19
Surface-Soil Positive Results Data Summary
OU10 IHSS 177

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
Test Group:BNACLP Units: µg/kg												
2-METHYLNAPHTHALENE	330	340	SS013493 (1)	410	SS013193 (2)	57 J:?	SS013793 (1)	57 J:?	SS013793 (1)	1	10	181.2
ACENAPHTHENE	330	360	SS013093 (1)	410	SS013193 (2)	74 J:?	SS013493 (1)	410 :?	SS013793 (1)	2	10	206.9
ANTHRACENE	330	360	SS013093 (1)	410	SS013193 (2)	110 J:?	SS013493 (1)	410 :?	SS013793 (1)	2	10	210.5
BENZO(a)ANTHRACENE	330	360	SS013093 (1)	410	SS013193 (2)	63 J:?	SS012993 (1)	950 :?	SS013793 (1)	3	10	270.8
BENZO(a)PYRENE	330	340	SS013793 (1)	410	SS013193 (2)	60 J:?	SS012993 (1)	390 :?	SS013493 (1)	2	10	200.5
BENZO(b)FLUORANTHENE	330	360	SS013093 (1)	410	SS013193 (2)	73 J:?	SS012993 (1)	1800 BD:?	SS013793 (1)	3	10	395.8
BENZO(ghi)PERYLENE	330	360	SS013093 (1)	410	SS013193 (2)	170 J:?	SS013493 (1)	990 :?	SS013793 (1)	2	10	274.5
BENZO(k)FLUORANTHENE	330	340	SS013493 (1)	410	SS013193 (2)	610 :?	SS013793 (1)	610 :?	SS013793 (1)	1	10	236.5
BENZOIC ACID	1600	1600	SS013493 (1)	2000	SS012993 (2)	44 J:?	SS013593 (1)	77 J:?	SS013793 (1)	2	10	757.1
BIS(2-ETHYLHEXYL) PHTHALATE	330	400	SS012993 (2)	410	SS013193 (2)	55 J:?	SS013093 (1)	420 :?	SS013793 (1)	6	10	160.9
BUTYL BENZYL PHTHALATE	330	340	SS013493 (1)	410	SS013193 (2)	120 J:?	SS013793 (1)	120 J:?	SS013793 (1)	1	10	187.5
CHRYSENE	330	360	SS013093 (1)	410	SS013193 (2)	69 J:?	SS012993 (1)	1200 :?	SS013793 (1)	3	10	306.4
DI-n-BUTYL PHTHALATE	330	360	SS013093 (1)	410	SS013193 (2)	48 J:?	SS013493 (1)	110 J:?	SS013793 (1)	2	10	174.3
DIBENZOFURAN	330	340	SS013493 (1)	410	SS013193 (2)	160 J:?	SS013793 (1)	160 J:?	SS013793 (1)	1	10	191.5
FLUORANTHENE	330	360	SS013093 (1)	410	SS013193 (2)	49 J:?	SS013293 (1)	2700 BD:?	SS013793 (1)	4	10	477.4
FLUORENE	330	360	SS013093 (1)	410	SS013193 (2)	53 J:?	SS013493 (1)	330 J:?	SS013793 (1)	2	10	196.8
NAPHTHALENE	330	340	SS013493 (1)	410	SS013193 (2)	84 J:?	SS013793 (1)	84 J:?	SS013793 (1)	1	10	183.9
PHENANTHRENE	330	360	SS013093 (1)	410	SS013193 (1)	43 J:?	SS013593 (1)	2200 :?	SS013793 (1)	6	10	378.8
PYRENE	330	390	SS012893 (1)	410	SS013193 (1)	41 J:?	SS013093 (1)	3000 BD:?	SS013793 (1)	7	10	516
Test Group:METADD Units: mg/kg												
CESIUM	1000	6.1	SS013093 (1)	9.6	SS012993 (2)	4.8 :?	SS012893 (1)	4.8 :?	SS012893 (1)	1	10	4.04
LITHIUM	100	**	**	**	**	4.3 :?	SS012893 (1)	8.3 B:J	SS013293 (1)	10	10	6.66
MOLYBDENUM	200	3.1	SS013693 (1)	4.2	SS012993 (1)	2.5 :?	SS012893 (1)	5 B:V	SS013793 (1)	2	10	2.19
STRONTIUM	200	**	**	**	**	27.9 B:J	SS013093 (1)	150 :J	SS013693 (1)	10	10	88.27
Test Group:SMETCLP Units: mg/kg												
ALUMINUM	200	**	**	**	**	6200 :V	SS013093 (1)	10200 :V	SS013293 (1)	10	10	8901
ARSENIC	10	**	**	**	**	2.1 :V	SS013093 (1)	7.3 :V	SS013393 (1)	10	10	4.95
BARIUM	200	**	**	**	**	55.4 :V	SS013093 (1)	464 :V	SS012993 (1)	10	10	195.07
BERYLLIUM	5	**	**	**	**	.19 B:V	SS013093 (1)	.81 B:V	SS012993 (1)	10	10	0.579
CALCIUM	5000	**	**	**	**	4400 :V	SS013093 (1)	69700 :V	SS013693 (1)	10	10	29551
CHROMIUM	10	**	**	**	**	7.3 :V	SS013093 (1)	43 :V	SS013793 (1)	10	10	13.04
COBALT	50	**	**	**	**	4 :?	SS012893 (1)	11.1 :V	SS013793 (1)	10	10	7.07
COPPER	25	**	**	**	**	12.1 :J	SS013693 (1)	31.2 :V	SS013793 (1)	10	10	20.14
IRON	100	**	**	**	**	8460 :?	SS012893 (1)	15000 :V	SS013793 (1)	10	10	12059
LEAD	3	**	**	**	**	8.9 :V	SS013093 (1)	101 :V	SS013793 (1)	10	10	25.77
MAGNESIUM	5000	**	**	**	**	2120 :?	SS012893 (1)	5390 :V	SS013293 (1)	10	10	3300
MANGANESE	15	**	**	**	**	139 :V	SS013593 (1)	317 :V	SS013793 (1)	10	10	225.6
MERCURY	0.2	0.05	SS013493 (1)	0.06	SS013293 (1)	.062 B:V	SS013193 (1)	.15 :V	SS013793 (1)	4	10	0.051
NICKEL	40	**	**	**	**	7 :?	SS012893 (1)	20.1 :V	SS013793 (1)	10	10	11.66
POTASSIUM	5000	**	**	**	**	736 B:V	SS013193 (1)	1960 :V	SS013793 (1)	10	10	1210
SELENIUM	5	0.57	SS013093 (1)	0.67	SS012893 (2)	.72 B:J	SS013793 (1)	.86 B:J	SS012993 (2)	5	9	0.5828
SILVER	10	0.92	SS013393 (1)	0.99	SS013693 (1)	1.2 :?	SS012893 (1)	1.9 B:J	SS013493 (1)	6	10	1.1105
SODIUM	5000	**	**	**	**	98.9 B:V	SS013793 (1)	474 B:V	SS013493 (1)	10	10	249.59
VANADIUM	50	**	**	**	**	19.2 :V	SS013093 (1)	32.2 :V	SS013293 (1)	10	10	26.08
ZINC	20	**	**	**	**	31.2 :?	SS012893 (1)	376 :V	SS013793 (1)	10	10	109.7

Notes:

A = Validation Qualifier: laboratory qualifer considered acceptable
B = Laboratory Qualifer: detected in blank
BKGND = Background concentraiton (DOE 1994c)
J = Laboratory Qaulifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
RBC = Risk-Based Concentration
V = Validation Qualifier: valid data

µg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
** = All samples reported with positive results; no nondetects reported
# = Indicates compound exceeds background RBC
- = There is no RBC for that compound

TABLE 3-20
Target Analytes for OU10 - IHSS 177
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG073094	SGG0465JE	8/18/94	REAL	Tetrachloroethene	2.90	µg/L	B	1.01
				Methane	10.00	ppm		20.00
	SGG0730JE	8/15/94	REAL	Tetrachloroethene	*14.00	µg/L	JB	0.24
				Methane	20.00	ppm		20.00
SG073194	SGG0970JE	8/15/94	REAL	Tetrachloroethene	4.20	µg/L	B	3.02
				Methane	20.00	ppm		20.00
SG073294	SGG0732JE	8/8/94	REAL	Tetrachloroethene	1.90	µg/L	B	0.24
SG073394	SGG0733JE	8/09/94	REAL	Tetrachloroethene	3.10	µg/L	J	0.00
SG073494	SGG0734JE	8/9/94	REAL	Tetrachloroethene	3.80	µg/L	JB	0.30
SG073594	SGG0971JE	8/15/94	REAL	Trichloroethene	8.76	µg/L	B	2.86
				Tetrachloroethene	70.00	µg/L	B	14.29
				Methane	20.00	ppm		20.00
SG073694	SGG0736JE	8/9/94	REAL	Tetrachloroethene	6.70	µg/L	JB	0.12
	SGG0972JE	8/15/94	REAL	Trichloroethene	11.29	µg/L	B	0.00
				Tetrachloroethene	*43.90	µg/L	B	2.00
				Methane	30.00	ppm		20.00
SG073794	SGG0973JE	8/15/94	REAL	Trichloroethene	12.00	µg/L	B	5.70
				Tetrachloroethene	41.00	µg/L	B	28.60
				Methane	40.00	ppm		20.00
SG073894	SGG0738JE	8/9/94	REAL	Tetrachloroethene	1.90	µg/L	B	0.30
SG073994	SGG0463JE	8/18/94	REAL	Acetone	2.00	µg/L		0.30
				Tetrachloroethene	*18.00	µg/L	B	1.01
	SGG0739JE	8/09/94	REAL	Tetrachloroethene	15.00	µg/L	JB	0.24
SG074094	SGG0740JE	8/08/94	REAL	cis-1,2-dichloroethene	18.00	µg/L	J	0.00
				Trichloroethene	6.40	µg/L	J	0.00
				Tetrachloroethene	*11.00	µg/L	J	0.00
				cis-1,2-dichloroethene	*9.60	µg/L		0.30
	SGG0974JE	8/15/94	REAL	Tetrachloroethene	5.50	µg/L	B	0.30
				Methane	20.00	ppm		20.00

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TABLE 3-20
Target Analytes for OU10 - IHSS 177
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG074194	SGG0976JE	8/15/94	REAL	cis-1,2-dichloroethene	36.00	µg/L		2.90
				Trichloroethene	1400.00	µg/L	JB	5.70
				Tetrachloroethene	910.00	µg/L	JB	29.00
				Methane	40.00	ppm		20.00
SG074294	SGG0977JE	8/15/94	REAL	cis-1,2-dichloroethene	2.80	µg/L		0.30
				Trichloroethene	1.60	µg/L	B	0.60
				Tetrachloroethene	11.00	µg/L	B	3.00
				Methane	20.00	ppm		20.00
SG074394	SGG0743JE	9/09/94	REAL	Methane	20.00	ppm		20.00
SG074494	SGG0979JE	8/15/94	REAL	cis-1,2-dichloroethene	73.00	µg/L	J	2.86
				Trichloroethene	190.00	µg/L	B	5.71
				Tetrachloroethene	1100.00	µg/L	B	29.00
				Methane	20.00	ppm		20.00
SG074594	SGG0745JE	9/09/94	REAL	Trichloroethene	*4.60	µg/L		0.57
				Tetrachloroethene	*16.00	µg/L		0.38
				Methane	20.00	ppm		20.00
	SGG0981JE	8/15/94	REAL	cis-1,2-dichloroethene	3.40	µg/L	J	0.30
				Trichloroethene	9.30	µg/L	B	0.60
				Tetrachloroethene	25.00	µg/L	JB	3.00
				Methane	40.00	ppm		20.00

Notes:

1) The target detection level of 1.0 µg/L applies to the following chemicals of concern: 1,1,1-trichloroethane, 2-butanone, acetone, benzene, carbon tetrachloride, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, cis-1,2-dichloroethene, and xylenes.

The field instrument detection level for hydrogen sulfide is 5 ppm.
The field instrument detection level for methane is 20 ppm.
Reported values of 10 ppm are estimated (see Section 3.1.3).

ppm = parts per million
REAL = environmental sample
µg/L = micrograms per liter
* = most reliable data

2) B = analyte detected in blank
J = estimated value

a concentration of 190.00 μg/L, and cis-1,2 DCE in a concentration of 73.00 μg/L. Approximately 20 feet east at SG074594, PCE decreases to a concentration of 16.00 μg/L, TCE decreases to 4.60 μg/L, and cis-1,2 DCE decreases to 3.40 μg/L. East of SG074594 at location SG073494, PCE is the only target analyte present above the target detection limit. At this location, PCE is present in a concentration of 3.80 μg/L. Southeast of SG073494 at location SG073393, PCE is present in a concentration of 3.10 μg/L. Northeast of SG074494 and SG074594, PCE decreases to concentrations of 14.00 μg/L at SG073094 and 4.2 μg/L at SG073194. No VOCs, except methane in a concentration of 20.00 ppm, are present at location SG074394, which is directly west of SG074494.

The highest concentrations of target analytes present on the western side of IHSS 177 are at SG074194. At this location, TCE is present in a concentration of 1400.00 μg/L, PCE in a concentration of 910.00 μg/L, and cis-1,2-DCE in a concentration of 36.00 μg/L. These concentrations decrease to the northeast at location SG074294 with TCE present in a concentration of 1.60 μg/L, PCE in a concentration of 11.00 μg/L, and cis-1,2,-DCE in a concentration of 2.80 μg/L. Concentrations also decrease to the east of SG074194 at location SG074094, where TCE is present in a concentration of 6.40 μg/l, PCE in a concentration of 11.00 μg/L, and cis-1,2-DCE in a concentration of 9.60 μg/L. Southeast of SG074194 at location SG073994, PCE and acetone are present in concentrations of 18.00 μg/L and 2.00 μg/L, respectively. Location SG073894, which is east of SG073994, exhibits no concentrations of VOCs present above target detection limits except PCE, which is present in a concentration of 1.90 μg/L.

The highest concentrations in the southeast of IHSS 177 are at location SG073593. At this location, PCE is present in a concentration of 70.00 μg/L and TCE is present in a concentration of 8.76 μg/L. To the west at sample site SG073694, PCE decreases to a concentration of 43.90 μg/L, and TCE increases to a concentration of 11.29 μg/L. West of SG073694 at location

SG073794, PCE decreases to a concentration of 41.00 μg/L, and TCE increases to a concentration of 12.00 μg/L.

Methane was detected in concentrations exceeding the target detection limit at 11 of the 16 sample locations. (Refer to Plate 13.) The maximum concentration of 40.00 ppm is present at three locations: SG074194, SG073794, and SG074594. The minimum concentration of 20.00 ppm is present at seven locations, predominantly in the northern half of the IHSS. In comparison to the methane concentrations at the OU7 landfill (DOE 1994d), the presence of methane in IHSS 177 appears to be low level and may be attributed to natural organic decay.

3.8 IHSS 181 - BUILDING 334 CARGO CONTAINER AREA

IHSS 181 is the site of a former cargo container area. The container was an 8- by 20- by 9-foot steel container that was used to store a maximum of eighteen 55-gallon drums. The cargo container was located on an asphalt pad, and a collection pan for secondary containment was located at the bottom of the container.

The area was used in the summer of 1984 to July 1986 for storage of drums containing waste machine oils, solvents, machine coolants, and possibly low-level radioactive wastes. There is no visual evidence or documentation of spills or leakage. Surface-soil samples were not required at this IHSS, per the *OU10 RFI/RI Work Plan* (DOE 1992a). No previous investigations have been conducted at this IHSS (DOE 1992a).

3.8.1 High Purity Germanium Survey

The HPGe survey data for the sole surveying location within IHSS 181 provided no evidence indicating anomalous activities for potassium-40, radium-226, thorium-232, uranium-235, uranium-238, americium-241, or plutonium-239 at IHSS 181. The activities identified at IHSS 181 were within the expected range of background values presented in Table 3-1 for all of the above isotopes. These results were further verified by an NaI detector survey before soil-gas sample collection. The HPGe location map for IHSS 181 is illustrated on Plate 1, the Americium Specific Activity Map.

3.8.2 Soil-Gas Survey

IHSS 181 is covered with asphalt under the former cargo location area. Three locations were sampled. The soil-gas points were located south of the IHSS at 20-foot spacing. Figure 3-14 presents the location of soil-gas samples, and Plate 14 exhibits analytes that exceed the target detection limit of 1.0 μg/L.

No VOCs except methane were detected above the target detection limit of 1.0 μg/L (Section 3.1.3). These data are presented in Table 3-21. Low-level concentrations of methane were present at all three soil-gas sample locations. A minimum concentration of 10.00 ppm was observed at SG043294. A maximum concentration of 50.00 ppm was observed at SG043194. The concentrations of methane observed at IHSS 181 appear to be very low level and can probably be attributed to the decay of naturally occurring organic material.

3.9 IHSS 182 - BUILDING 444/453 DRUM STORAGE AREA

IHSS 182 is located between Buildings 444 and 453 and covers an area of approximately 1,700 square feet (ft^2). The area is currently roped off and is generally empty, although trash, such as wood, is sometimes temporarily placed there. There are no berms around the area.

TABLE 3-21
Target Analytes for OU10 - IHSS 181
Soil-Gas Environmental Samples
(Concentrations Above Detection Levels for 14 Chemicals of Concern[1])

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER	DETECTION LIMIT
SG043094	SGG0430JE	8/17/94	Real	Methane	30.00	ppm		20.00
SG043194	SGG0431JE	8/17/94	Real	Methane	50.00	ppm		20.00
SG043294	SGG0432JE	8/17/94	Real	Methane	10.00	ppm		20.00

Notes:

1) The target detection level of 1.0 µg/L applies to the following chemicals of concern: 1,1,1-trichloroethane, 2-butanone, acetone, benzene, carbon tetrachloride, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, cis-1,2-dichloroethene, and xylenes.

The field instrument detection level for hydrogen sulfide is 5 ppm.
The field instrument detection level for methane is 20 ppm.
Reported values of 10 ppm are estimated (see Section 3.1.3).

ppm = parts per million
Real = environmental sample

IHSS 182 was first used as a storage area. In May 1957, it was noted that numerous drums of depleted uranium oxide were being stored in the "backyard" of Building 444. Originally, 55-gallon drums were placed directly on the ground. In the mid-1970s, the top 4 inches of soil in a portion of the Drum Storage Area was removed because it was believed to be contaminated. It was replaced with 4 inches of asphalt. However, drums were still stored on exposed soil in the remaining portion of the Drum Storage Area. It is not known where the contaminated soil was moved or stored or whether contaminated soil samples were collected and analyzed.

The maximum number of drums stored at one time was approximately 200. Some of these drums contained unused oil, waste hydraulic oils, and chlorinated solvents. The exact number of drums containing contaminated waste oils or solvents is unknown, although the total container storage capacity at any given time was 11,000 gallons (DOE 1992a). Beryllium and low-level uranium contamination were sometimes present in the waste. Other sources of contamination near IHSS 182 include Building 453, a former oil storage area and the Building 334 Cargo Container (DOE 1992a).

Soil investigations in 1988 indicated the presence of acetone; 1,1,1-TCA; toluene; ethylbenzene; total xylenes; naphthalene; phenanthrene; fluoranthene; and pyrene. Samples were collected from 1-foot deep excavations below a concrete sidewalk. A 1988 FIDLER survey found readings above background on the asphalt areas and in areas along the buildings and cracks between the concrete and asphalt (DOE 1992a). *The OU10 RFI/RI Work Plan* lists the results of previous investigations (DOE 1992a). As set forth in the OU10 Work Plan, surface-soil samples were not collected at this IHSS because of the thick asphalt layer.

3.9.1 High Purity Germanium Survey

The HPGe survey data for the sole surveying location within IHSS 182 provided no evidence indicating elevated activities potassium-40, radium-226, thorium-232, americium-241, or plutonium-239 at IHSS 182. However, activities of both uranium-235 and -238 appeared to be elevated at this IHSS. The presence of uranium-238 may be attributed to the nearness of this HPGe sample location to Building 444 which handled significant amounts of uranium-238. The area that was identified as a "hot spot" may also be attributed to a painted area on the asphalt approximately 10 feet north of IHSS 182. The area was identified by the NaI sources. The HPGe location for IHSS 182 is illustrated on Plate 1, the Americium Specific Activity Map.

3.9.2 Soil-Gas Survey

Thirteen locations were sampled for soil-gas on a 20-foot grid. Figure 3-15 presents soil-gas locations for IHSS 182.

Concentrations of target VOCs equal to or exceeding the target detection limit of 1.0 μg/L (Section 3.1.3) are listed in Table 3-22. All 13 locations exhibited VOCs present in concentrations above target detection limits. (Refer to Plate 15.) Sample points of the three highest concentrations of VOCs are in the northern and eastern part of IHSS 182.

The highest concentrations of target analytes on the north of IHSS 182 are at two locations. At sample site SG071694, 1,1,1, TCA is present in a concentration of 690.00 μg/L, PCE in a concentration of 110.00 μg/L, cis-1,2-DCE in a concentration of 46.00 μg/L, TCE in a concentration of 13.00 μg/L, and acetone in a concentration of 4.10 μg/L. Directly west at sample site SG072994, TCE is present in a concentration of 260.00 μg/L, PCE in a concentration of 200.00 μg/l, 1,1,1-TCA in a concentration of 32.00 μg/L, cis-1,2-DCE in a

TABLE 3-22
Target Analytes for OU10 - IHSS 182
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG071694	SGG0716JE	8/10/94	Real	Acetone	1.00	µg/L		0.03
				1,1,1-Trichloroethane	212.00	µg/L	J	0.03
				cis-1,2-dichloroethene	28.00	µg/L	J	0.03
				Trichloroethene	19.00	µg/L	J	0.03
				Tetrachloroethene	31.00	µg/L	JB	0.12
	SGG0993JE	8/16/94	Real	Acetone	*4.10	µg/L		2.90
				1,1,1-Trichloroethane	*690.00	µg/L	J	2.90
				cis-1,2-dichloroethene	*46.00	µg/L		2.90
				Trichloroethene	*13.00	µg/L		2.90
				Tetrachloroethene	*110.00	µg/L	B	23.00
				Methane	40.00	ppm		20.00
SG071794	SGG0991JE	8/16/94	Real	Acetone	2.60	µg/L		0.57
				2-Butanone	1.90	µg/L		0.76
				1,1,1-Trichloroethane	9.40	µg/L		0.57
				Benzene	1.50	µg/L		0.57
				Tetrachloroethene	13.00	µg/L	B	4.57
				Methane	260.00	ppm		20.00
SG071894	SGG0990JE	8/16/94	Real	1,1,1-Trichloroethane	6.70	µg/L		2.90
				Benzene	3.20	µg/L		2.90
				Tetrachloroethene	50.00	µg/L	B	23.00
				Methane	60.00	ppm		20.00
SG071994	SGG0988JE	8/16/94	Real	Acetone	3.10	µg/L		2.90
				1,1,1-Trichloroethane	47.00	µg/L		2.90
				cis-1,2-dichloroethene	40.00	µg/L		2.90
				Trichloroethene	18.00	µg/L		2.90
				Tetrachloroethene	290.00	µg/L	JB	23.00
				Methane	60.00	ppm		20.00
SG072094	SGG0720JE	9/08/94	Real	Trichloroethene	* 64.00	µg/L		2.90
				Tetrachloroethene	1.90	µg/L		1.90
				Trichloroethene	24.00	µg/L	J	0.30

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TABLE 3-22
Target Analytes for OU10 - IHSS 182
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG072194	SGG0721JE	8/10/94	Real	1,1,1-Trichloroethane	49.00	µg/L	J	0.03
	SGG0985JE	8/16/94	Real	1,1,1-Trichloroethane	10.00	µg/L		0.57
				Trichloroethene	5.80	µg/L		0.57
				Tetrachloroethene	8.90	µg/L		0.57
				Methane	60.00	ppm		20.00
SG072394	SGG0451JE	8/17/94	Real	Acetone	1.10	µg/L		0.10
				1,1,1-Trichloroethane	1.60	µg/L		0.10
				Benzene	1.20	µg/L		0.10
				cis-1,2-dichloroethene	2.70	µg/L		0.10
				Trichloroethene	4.80	µg/L	J	0.10
				Toluene	1.30	µg/L		0.20
				Tetrachloroethene	4.50	µg/L	J	0.00
				Methane	10.00	ppm		20.00
	SGG0723JE	9/08/94	Real	1,1,1-Trichloroethane	2.60	µg/L	J	0.03
				1,1,1-Trichloroethane	* 2.2	µg/L		0.30
				cis-1,2-dichloroethene	1.10	µg/L		0.03
				Trichloroethene	8.30	µg/L	J	0.03
				Tetrachloroethene	8.60	µg/L	J	0.02
				cis-1,2-dichloroethene	* 1.4	µg/L		0.30
				Trichloroethene	* 10.00	µg/L		0.30
				Tetrachloroethene	* 12.00	µg/L		0.20
SG072494	SGG0450JE	8/17/94	Real	Acetone	2.50	µg/L		0.95
				Benzene	1.30	µg/L		0.95
				Trichloroethene	7.40	µg/L		0.95
				Tetrachloroethene	13.00	µg/L		0.95
				Methane	*500.00	ppm		20.00
	SGG0467JE	8/19/94	Real	Acetone	*4.90	µg/L		0.60
				2-Butanone	1.70	µg/L		0.80
				Benzene	*1.80	µg/L		0.60
				cis-1,2-dichloroethene	1.30	µg/L		0.60
				Trichloroethene	*14.00	µg/L		0.60
				Tetrachloroethene	*15.00	µg/L		0.40
				Methane	380.00	ppm		20.00

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TABLE 3-22
Target Analytes for OU10 - IHSS 182
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
SG072594	SGG0928JE	8/10/94	Dup	Acetone	1.30	µg/L		0.03
				cis-1,2-dichloroethene	3.70	µg/L	J	0.03
				Trichloroethene	2.00	µg/L		0.03
				Toluene	1.30	µg/L		0.11
				Tetrachloroethene	3.30	µg/L	JB	0.12
				Total Xylenes	3.07	µg/L		0.02
	SGG0997JE	8/16/94	Real	Methane	20.00	ppm		20.00
SG072694	SGG0983JE	8/16/94	Real	Trichloroethene	2.00	µg/L		0.57
				Tetrachloroethene	12.00	µg/L	B	4.57
SG072794	SGG0999JE	8/17/94	Real	1,1,1-Trichloroethane	1.40	µg/L		0.57
				cis-1,2-dichloroethene	1.00	µg/L		0.57
				Trichloroethene	14.00	µg/L		0.57
				Tetrachloroethene	7.70	µg/L		0.57
				Methane	50.00	ppm		20.00
SG072894	SGG0728JE	9/08/94	Real	cis-1,2-dichloroethene	26.00	µg/L		1.22
				Trichloroethene	23.00	µg/L		1.22
				Tetrachloroethene	19.00	µg/L		0.82
				Methane	10.00	ppm		20.00
	SGG0996JE	8/16/94	Real	Acetone	1.50	µg/L		0.57
				2-Butanone	1.40	µg/L		0.76
				Benzene	1.10	µg/L		0.57
				cis-1,2-dichloroethene	36.00	µg/L		0.57
				Trichloroethene	20.00	µg/L		0.57
				Tetrachloroethene	61.00	µg/L	JB	4.57
				Methane	20.00	ppm		20.00
SG072994	SGG0729JE	8/10/94	Real	1,1,1-Trichloroethane	68.00	µg/L	J	0.03
				Carbon Tetrachloride	3.20	µg/L	J	0.03
				cis-1,2-dichloroethene	1.90	µg/L		0.03
				Trichloroethene	24.00	µg/L	J	0.03
				Toluene	2.30	µg/L	J	0.11
				Tetrachloroethene	13.00	µg/L	J	0.03

TABLE 3-22
Target Analytes for OU10 - IHSS 182
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER[2]	DETECTION LIMIT
	SGG0995JE	8/16/94	Real	Acetone	3.90	µg/L		2.90
				2-Butanone	4.70	µg/L		3.80
				1,1,1-Trichloroethane	*32.00	µg/L		2.90
				cis-1,2-dichloroethene	*15.00	µg/L		2.90
				Trichloroethene	*260.00	µg/L	J	2.90
				Tetrachloroethene	*200.00	µg/L	B	23.00
				Methane	20.00	ppm		20.00

<u>Notes</u>:

1) The target detection level of 1.0 µg/L applies to the following chemicals of concern: 1,1,1-trichloroethane, 2-butanone, acetone, benzene, carbon tetrachloride, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, cis-1,2-dichloroethene, and xylenes.

The field instrument detection level for hydrogen sulfide is 5 ppm.
The field instrument detection level for methane is 20 ppm.
Reported values of 10 ppm are estimated (see Section 3.1.3).

2) B = analyte detected in blank
J = estimated value

DUP = duplicate sample
ppm = parts per million
Real = Environmental sample
µg/L = micrograms per liter
* = most reliable data

concentration of 15.00 μg/L, 2-butanone in a concentration of 4.70 μg/L, toluene in a concentration of 2.30 μg/L, acetone in a concentration of 3.90 μg/L, and carbon tetrachloride in a concentration of 3.20 μg/L. SG072994 is the only location in IHSS 182 where carbon tetrachloride was detected in concentrations exceeding the target detection limit. Southwest of SG072994 at location SG072894, the concentration of TCE decreases to 23.00 μg/L, PCE decreases to 19.00 μg/L, cis-1,2-DCE increases to 26.00 μg/L, 2-butanone decreases to 1.40 μg/L, and acetone decreases to 1.50 μg/L. Carbon tetrachloride, toluene, and 1,1,1-TCA are not present in concentrations exceeding the target detection limits at SG072894. Benzene, which is not present in SG072994, is present at SG072894 in a concentration of 1.10 μg/L. On the eastern side of SG071694 at location SG071794, 1,1,1-TCA decreases to a concentration of 9.40 μg/L, PCE decreases to a concentration of 13.00 μg/L and acetone decreases to a concentration of 2.60 μg/L. 2-Butanone, which is not present in SG071694, is present at SG071794 in a concentration of 1.90 μg/L.

Concentrations of PCE, acetone, cis-1,2-DCE, TCE, 2-butanone, benzene, and toluene are present in the southwest part of the IHSS ranging in concentrations from a minimum of 1.00 μg/L (cis-1,2-DCE) at SG072794 to a maximum concentration of 15 μg/L (PCE) at SG072494. Total xylenes were detected in a concentration exceeding the target detection limit at only one sample point in the IHSS. At this location, SG072594, Total xylenes are present in a concentration of 3.07 μg/L.

In the eastern part of IHSS 182, concentrations are highest at SG071994. At this location, PCE is present in a concentration of 290.00 μg/L, 1,1,1-TCA in a concentration of 47.00 μg/L, cis-1,2,-DCE in a concentration of 40.00 μg/L, TCE in a concentration of 18.00 μg/L, and acetone in a concentration of 3.10 μg/L. To the south of this location, SG072094 TCE increases to a concentration of 64.00 μg/L and PCE decreases to a concentration of 1.90 μg/L. West of SG071994 at location SG072194, PCE decreases to 8.90 μg/L, 1,1,1-TCA increases to 49.00

μg/L, and TCE decreases to 5.80 μg/L. Acetone and cis-1,2-DCE are not present in concentrations exceeding the target detection limits at location SG072194. To the north of SG071994 at location SG071894, PCE decreases to a concentration of 50.00 μg/L, and 1,1,1-TCA decreases to a concentration of 6.70 μg/L. Benzene is also present in SG071894 in a concentration of 3.20 μg/L but it is not present in a concentration exceeding the target detection limit at SG071994.

Methane was detected in concentrations exceeding the detection limit at eleven locations in IHSS 182. Methane concentrations range from a minimum of 10 ppm at location SG072394 to a maximum of 500 ppm at location SG072494. In comparison to methane concentrations in the landfill at OU7 (DOE 1994d), the presence of methane in IHSS 182 appears to be low level and can be attributed to natural organic decay.

3.10 IHSS 205 - BUILDING 460 SUMP #3 ACID SIDE

IHSS 205 is located at the southeastern corner of Building 460 at the acid solvent dumpsters. These dumpsters were operated as interim status units during 1986 and 1987. Today they are used as a 90-day accumulation area rather than an interim status unit.

The dumpsters, which are constructed with 3/16-inch thick stainless-steel walls, have a storage capacity of 250 gallons each. They are contained within a concrete bermed area with a concrete divider. Figure 3-16 shows the location of the dumpsters and Building 460. Detailed background information is presented in Section 2 of the *OU10 RFI/RI Work Plan* (DOE 1992a).

The *OU10 RFI/RI Work Plan* (DOE 1992a) required a visual inspection to observe possible leakage or stained areas of the acid dumpsters in IHSS 205. If staining was observed, a surface-soil sample and residue samples would have been required. No soil-gas sampling was required.

During visual inspection, it was observed that the tanks were disconnected, taken out of service, and triple-rinsed. Documentation of triple rinsing was found on tags attached to the tanks. Residual samples were therefore not collected because the residual samples would not be representative of the original tank contents. No staining was observed on the ground surrounding the tanks. Because there was no staining, no surface-soil samples were collected.

No HPGe survey data was collected at IHSS 205; however, an HPGe survey location for OU12, Station I-12, is within approximately 30 feet of IHSS 205 and was used to assess radiological activity associated with IHSS 205. Activities of both uranium-235 and -238 appear to be elevated near this IHSS. These activities may be attributed to "shine" from adjacent buildings. No NaI survey was performed at IHSS 205 because neither soil nor soil-gas samples were collected. Thus, the results from this HPGe location cannot be verified and it cannot be determined if anomalies exist in IHSS 205.

3.11 IHSS 206 - INACTIVE D-836 HAZARDOUS WASTE TANK

IHSS 206 was previously identified in the RCRA Part B permit application as Unit #431.14. The unit is a portion of the Building 374 Waste Treatment Facility (DOE 1992a). According to the Work Plan (DOE 1992a), the area investigated is the area outside Building 374 where a mobile hazardous waste tank (Tank D-836) was connected to the building. The now-inactive carbon steel tank was constructed in 1962. It was 8 feet in diameter by 49.5 feet in length and had a total storage capacity of 19,000 gallons.

Before 1975, the tank was probably used to store Air Force fuel at another location. From 1975 to 1987, the tank was used to store off-specification Building 374 product water (DOE

1992a). In February 1980, a spill of condensate water containing low concentrations of tritium occurred when a line from the evaporator to the tank was disconnected. The tank was not secondarily contained.

No previous soil sampling investigations have been conducted at this site, nor are upgradient or downgradient groundwater data available for the area near the IHSS.

3.11.1 High Purity Germanium Survey

In accordance with the *OU10 RFI/RI Work Plan* (DOE 1992a), HPGe readings have not been taken at IHSS 206. However, an HPGe survey will be completed at IHSS 206 and those results will be analyzed when available.

3.11.2 Surface-Soil Sampling

Historical information indicated the presence of metals and radionuclides; therefore, the Work Plan (DOE 1992a) specified surface-soil sample analyses only for metals and tritium. Samples for metals analyses were collected on an earlier date than the samples collected for tritium analyses, although the sample locations did not change. Figure 3-17 shows surface-soil sample locations. Ten locations were sampled, including eight where the tank was formerly located, one where the transfer pipe exited the building (SS011593), and one on the north side of the former location of the tank (SS010693). A duplicate sample was collected at SS011493.

Analytical results for surface-soil samples collected at IHSS 206 have not been completely validated. However, the analytical data were examined to best identify positive detections or nondetects within the nonvalidated portion. Table 3-23 provides results for all detected constituents. Table 3-24 is a summary of the analytical data for IHSS 206. Plate 16 shows

TABLE 3-23
Surface-Soil Positive Results
OU10 - IHSS 206

Sample Location:			SS010693	SS010793	SS010893	SS010993	SS011093	SS011193	SS011293	SS011393	SS011493	SS011493	SS011593
Sample Identification Number:			SSG1189JE	SSG1190JE	SSG1191JE	SSG1192JE	SSG1193JE	SSG1194JE	SSG1195JE	SSG1196JE	SSG1197JE	SSG1301JE	SSG1198JE
Date Sampled:			21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94
Test Group:METADD Units:mg/kg	**MDL**	**RBC/ BKGND**											
CESIUM	1000	0.00E 0 / 630.80E 0	4.1 :?	4 :?	4.1 :?	6.2 :?	5.8 :?	4 :?	3.8 :?	4 :?	3.9 :?	3.8 :?	6 :?
LITHIUM	100	0.00E 0 / 20.00E 0	5.3 :?	5.4 :?	6.2 :?	5.3 :?	5.7 :?	4.9 :?	6 :?	5.7 :?	5.4 :?	5.3 :?	5.9 :?
MOLYBDENUM	200	9.64E 0 / 40.00E 0	3.4 :?	4.2 :?	4.1 :?	3.6 :?	3.4 :?	3.1 :?	3.8 :?	3.2 :?	3 :?	3.9 :?	4.3 :?
STRONTIUM	200	1.65E 5 / 90.10E 0	22.5 :?	22.6 :?	23.4 :?	22.6 :?	17.7 :?	14.6 :?	19.3 :?	16.9 :?	16.4 :?	17.4 :?	16.2 :?
Test Group:SMETCLP Units:mg/kg													
ALUMINUM	200	0.00E 0 / 21915.40E 0	6090 :?	5570 :?	7540 :?	6340 :?	5250 :?	4530 :?	6560 :?	4840 :?	4330 :?	4570 :?	5610 :?
ANTIMONY	60	1.10E 2 / 50.00E 0											3.2 :?
ARSENIC	10	3.66E-1 / 12.90E 0	3.5 :?*	6.4 :?*	5 :?*	3.9 :?*	3 :?*	3.3 :?*	4.5 :?*	3.5 :?*	2.4 :?*	5.1 :?*	2.8 :?*
BARIUM	200	1.92E 4 / 528.00E 0	58.2 :?	59.7 :?	63.8 :?	66.3 :?	46.1 :?	49 :?	64.2 :?	45.8 :?	44.9 :?	42.6 :?	52.3 :?
BERYLLIUM	5	1.33E 0 / 5.20E 0	.37 :?	.35 :?	.5 :?	.53 :?	.35 :?	.24 :?	.45 :?	.3 :?	.25 :?	.26 :?	.32 :?
CADMIUM	5	1.37E 2 / 5.00E 0		.34 :?									.6 :?
CALCIUM	5000	0.00E 0 / 13573.30E 0	4050 :?	3940 :?	4160 :?	4680 :?	2920 :?	2300 :?	3180 :?	3290 :?	2640 :?	2530 :?	5940 :?
CHROMIUM	10	9.62E 2 / 24.80E 0	10.6 :?	12.2 :?	11.4 :?	10.8 :?	10.3 :?	8.1 :?	10.4 :?	9.1 :?	11.1 :?	8 :?	12 :?
COBALT	50	0.00E 0 / 24.80E 0	5 :?	4.9 :?	5.5 :?	4.8 :?	4.3 :?	4.1 :?	5.3 :?	4.2 :?	4.1 :?	4 :?	5.3 :?
COPPER	25	1.10E 4 / 27.30E 0	21 :?	35.9 :?#	19 :?	19.8 :?	15 :?	12.6 :?	15.6 :?	12.1 :?	12.8 :?	11.5 :?	24.4 :?
IRON	100	0.00E 0 / 28160.40E 0	11300 :?	11800 :?	13400 :?	12300 :?	10500 :?	10000 :?	12300 :?	11100 :?	10100 :?	13100 :?	14500 :?
LEAD	3	0.00E 0 / 61.40E 0	11.1 :?	11.1 :?	11.3 :?	11.9 :?	8.4 :?	7.4 :?	10.3 :?	7.9 :?	8 :?	7.7 :?	15.3 :?
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	2250 :?	2370 :?	2530 :?	2400 :?	2060 :?	1850 :?	2340 :?	2040 :?	1960 :?	1880 :?	3690 :?
MANGANESE	15	1.37E 3 / 2253.50E 0	191 :?	196 :?	229 :?	209 :?	166 :?	164 :?	223 :?	168 :?	185 :?	236 :?	329 :?
MERCURY	0.2	8.23E 1 / 0.20E 0		.048 :?									
NICKEL	40	5.49E 3 / 26.90E 0	8.1 :?	8.9 :?	8.5 :?	8.4 :?	8.6 :?	6.2 :?	13.9 :?	7.2 :?	6.6 :?	6.8 :?	8.6 :?
POTASSIUM	5000	0.00E 0 / 5256.80E 0	1290 :?	1290 :?	1540 :?	1430 :?	1290 :?	1130 :?	1380 :?	1290 :?	1200 :?	1150 :?	2290 :?
SILVER	10	1.37E 3 / 10.00E 0	1.3 :?	1.5 :?	1.4 :?	1.1 :?	1.3 :?	1.4 :?	1.6 :?	1.3 :?	1.1 :?	1.3 :?	1.2 :?
SODIUM	5000	0.00E 0 / 1108.00E 0	423 :?	183 :?	302 :?	251 :?	256 :?	143 :?	197 :?	160 :?	199 :?	239 :?	149 :?
VANADIUM	50	1.92E 3 / 55.60E 0	20 :?	21.3 :?	22.6 :?	20.4 :?	17.9 :?	15.2 :?	20.4 :?	17.4 :?	15.6 :?	17.3 :?	18 :?
ZINC	20	8.23E 4 / 86.60E 0	70.7 :?	76 :?	71 :?	68 :?	51.9 :?	41.3 :?	55.7 :?	44.9 :?	42.5 :?	118 :?#	258 :?#

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BKGND = Background concentration (DOE 1994c)
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
RBC = Risk-Based Concentration
V = Validation Qualifier: valid data

µg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
** = All samples reported with positive results; no nondetects reported
# = Indicates compound exceeds background
- = There is no RBC for that compound

TABLE 3-24
Surface-Soil Positive Results Data Summary
OU10 - IHSS 206

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
Test Group:METADD Units:mg/kg												
CESIUM	1000	**	**	**	**	3.8 :?	SS011293 (1)	6.2 :?	SS010993 (1)	10	10	4.59
LITHIUM	100	**	**	**	**	4.9 :?	SS011193 (1)	6.2 :?	SS010893 (1)	10	10	5.58
MOLYBDENUM	200	**	**	**	**	3.1 :?	SS011193 (1)	4.3 :?	SS011593 (1)	10	10	3.7
STRONTIUM	200	**	**	**	**	14.6 :?	SS011193 (1)	23.4 :?	SS010893 (1)	10	10	19.32
Test Group:SMETCLP Units:mg/kg												
ALUMINUM	200	**	**	**	**	4530 :?	SS011193 (1)	7540 :?	SS010893 (1)	10	10	5690
ANTIMONY	60	2.5	SS011093 (3)	2.7	SS010693 (3)	3.2 :?	SS011593 (1)	3.2 :?	SS011593 (1)	1	10	1.49
ARSENIC	10	**	**	**	**	2.8 :?	SS011593 (1)	6.4 :?	SS010793 (1)	10	10	4.1
BARIUM	200	**	**	**	**	44.9 :?	SS011493 (1)	66.3 :?	SS010993 (1)	10	10	55.03
BERYLLIUM	5	**	**	**	**	.24 :?	SS011193 (1)	.53 :?	SS010993 (1)	10	10	0.367
CADMIUM	5	0.15	SS011293 (2)	0.17	SS010693 (1)	.34 :?	SS010793 (1)	.6 :?	SS011593 (1)	2	10	0.1575
CALCIUM	5000	**	**	**	**	2300 :?	SS011193 (1)	5940 :?	SS011593 (1)	10	10	3710
CHROMIUM	10	**	**	**	**	8.1 :?	SS011193 (1)	12.2 :?	SS010793 (1)	10	10	10.6
COBALT	50	**	**	**	**	4.1 :?	SS011193 (2)	5.5 :?	SS010893 (1)	10	10	4.75
COPPER	25	**	**	**	**	12.1 :?	SS011393 (1)	35.9 :?	SS010793 (1)	10	10	18.82
IRON	100	**	**	**	**	10000 :?	SS011193 (1)	14500 :?	SS011593 (1)	10	10	12030
LEAD	3	**	**	**	**	7.4 :?	SS011193 (1)	15.3 :?	SS011593 (1)	10	10	10.27
MAGNESIUM	5000	**	**	**	**	1850 :?	SS011193 (1)	3690 :?	SS011593 (1)	10	10	2349
MANGANESE	15	**	**	**	**	164 :?	SS011193 (1)	329 :?	SS011593 (1)	10	10	211.1
MERCURY	0.2	0.04	SS011293 (1)	0.05	SS010693 (1)	.048 :?	SS010793 (1)	.048 :?	SS010793 (1)	1	10	0.0267
NICKEL	40	**	**	**	**	6.2 :?	SS011193 (1)	13.9 :?	SS011293 (1)	10	10	8.52
POTASSIUM	5000	**	**	**	**	1130 :?	SS011193 (1)	2290 :?	SS011593 (1)	10	10	1413
SILVER	10	**	**	**	**	1.1 :?	SS010993 (1)	1.6 :?	SS011293 (1)	10	10	1.34
SODIUM	5000	**	**	**	**	143 :?	SS011193 (1)	423 :?	SS010693 (1)	10	10	230.3
VANADIUM	50	**	**	**	**	15.2 :?	SS011193 (1)	22.6 :?	SS010893 (1)	10	10	19.05
ZINC	20	**	**	**	**	41.3 :?	SS011193 (1)	258 :?	SS011593 (1)	10	10	85.55

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BKGND = Background concentration (DOE 1994c)
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
RBC = Risk-Based Concentration
V = Validation Qualifier: valid data

μg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
** = All samples reported with positive results; no nondetects reported
# = Indicates compound exceeds background
- = There is no RBC for that compound

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metals concentrations above background. Only two metals were reported above background: copper at SS010793 and zinc at SS011493 and SS011593. Neither metal exceeded its associated RBC. Analytical results for tritium were reported at less than the SQL and are assumed to be nondetects. Further evaluation of the data will be conducted when the results are validated.

3.12 IHSS 207 - INACTIVE BUILDING 444 ACID DUMPSTER

IHSS 207 is the former site of Building 444 acid dumpsters. The dumpsters were located to the east of Building 444 (Figure 3-18). Five-hundred-gallon dumpsters receiving waste were placed in an asphalt bermed area. From 1980 through 1987, they were used to store acidic wastes from Building 444. No previous investigations have been performed at this IHSS, and no spills have been reported.

Per the *OU10 RFI/RI Work Plan* (DOE 1992a), a visual inspection was required to determine whether surface sampling should be conducted if exposed soil or staining is present. A site inspection was conducted and no leakage, stained areas, or exposed soil was observed; therefore, the site was not sampled for surface-soil or soil gas during the Phase I, Stage 1 field investigation.

3.12.1 High Purity Germanium Survey

The HPGe survey data for the sole survey location adjacent to IHSS 207 provided no evidence indicating anomalous activities for potassium-40, radium-226, uranium-235, uranium-238, or plutonium-239 at IHSS 207. The activities identified at IHSS 207 were within the expected range of background values presented in Table 3-1 for all of the above isotopes. However, the americium-241 activity appears elevated (2.7 pCi/g). The presence of americium-241 at this therefore, is not suspected to be an elevated concentration. (See Recommendations, Section 6.12.) The HPGe location for IHSS 207 is illustrated on Plate 1, the Americium Specific Activity Map.

3.13 IHSS 208 - INACTIVE 444/447 WASTE STORAGE AREA

IHSS 208 is an inactive waste storage area that was previously identified in the RCRA permit application as Unit #3. The storage area was located near Buildings 444 and 453 in the same vicinity as IHSS 182. The storage area consisted of a 20-foot by 8-foot cargo container with a maximum waste volume of 990 gallons (DOE 1992a).

IHSS 208 was used from 1986 to 1987 as Unit #3. Typical stored waste included a composite of nitric acid with silver, sodium fluoride, sodium fluoride solution, plating acids (hydrochloric acid, nitric acid, and hydrofluoric acid) with concentrated chromium plating solution, concentrated cadmium cyanide solution, nickel sulfamate, and developer and fixer (DOE 1992a). The storage area had secondary containment. No leaks or spills were reported in this area.

No previous soil investigations have been conducted at this site. Upgradient or downgradient groundwater data are not available for this area.

3.13.1 High Purity Germanium Survey

No HPGe survey data was collected specifically for IHSS 208. However, an HPGe survey location for OU12, station G-12, is within approximately 25 feet of IHSS 208 and was used to assess radiological activity associated with IHSS 208. Further, an HPGe survey location for IHSS 182 in OU10, station 182-10, is within approximately 75 feet of IHSS 208. Both of these locations indicate that uranium-238 activity is elevated. Station G-12, which is closest to IHSS

208, does not indicate that uranium-235 activity is elevated, but station 182-10 does indicate that uranium-235 activity is elevated. These elevated activities may be attributed to "shine" from building 444, which handled uranium-238, or they may also be attributed to a painted area on the asphalt approximately 30 feet west of IHSS 208, which was identified during the NaI survey. These activities are not suspected to be anomalies at IHSS 208 based on the NaI survey results. The HPGe locations used for IHSS 208 are illustrated on Plate 1, the Americium Specific Activity Map.

3.13.2 Surface-Soil Sampling

Historical information for IHSS 208 indicated the presence of acids, anions, and metals (DOE 1992a). The IHSS is covered by asphalt, except for a narrow strip in its center. Three surface-soil samples were collected in the center of the site on the exposed soil area. A duplicate sample was collected at SS013993. Sample locations are shown in Figure 3-19. The samples were analyzed for pH, metals, and cyanide. Concentrations are shown on Plate 17.

Analytical results of positive detections are presented in Table 3-25 and summarized in Table 3-26. Only two metals exceeded background: zinc and copper. Zinc exceeded background at all sample locations, and copper was greater than background at SS013993. However, the reported concentrations were not greater than the RBC. Cyanide exceeded background at SS013993.

3.14 IHSS 210 - UNIT 16, BUILDING 980 CARGO CONTAINER

IHSS 210 is located south of Spruce Street and east of 10th Street. The area southeast of Building 980 was used for drum storage of liquid and solid waste including automotive oils; stoddard solvent; paints; paint thinner; paper and rags contaminated with oils, grease, gasoline,

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TABLE 3-25
Surface-Soil Positive Results
OU10 - IHSS 208

Sample Location:			SS013893	SS013993	SS013993	SS014093
Sample Identification Number:			SSG1221JE	SSG1222JE	SSG1307JE	SSG1223JE
Date Sampled:			27-Jul-94	27-Jul-94	27-Jul-94	27-Jul-94
Test Group:METADD Units:mg/kg	**MDL**	**RBC / BKGND**				
LITHIUM	100	0.00E 0 / 20.00E 0	6.9 B:JA	5.9 B:JA	5.5 B:JA	4.7 B:JA
MOLYBDENUM	200	9.64E 0 / 40.00E 0	4.6 B:V			
STRONTIUM	200	1.65E 5 / 90.10E 0	15.1 B:JA	16 B:JA	16 B:JA	17.7 B:JA
Test Group:SMETCLP Units:mg/kg						
ALUMINUM	200	0.00E 0 / 21915.40E 0	12700 :V	6430 :V	6090 :V	5310 :V
ARSENIC	10	3.66E-1 / 12.90E 0	8.6 :V*	4.1 :V*	4.3 :V*	3.7 :V*
BARIUM	200	1.92E 4 / 528.00E 0	72.9 :V	62.4 :V	60.1 :V	49.3 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	1.2 :V	.64 B:V	.78 B:V	.48 B:V
CALCIUM	5000	0.00E 0 / 13573.30E 0	3020 :V	2950 :V	2850 :V	3500 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	15.2 :V	13.6 :V	10.9 :V	13.8 :V
COBALT	50	0.00E 0 / 24.80E 0	12.6 :V	6.4 B:V	5.1 B:V	4.7 B:V
COPPER	25	1.10E 4 / 27.30E 0	15.1 :V	38.5 :V#	24.2 :V	22.4 :V
IRON	100	0.00E 0 / 28160.40E 0	16300 :V	11100 :V	10300 :V	10600 :V
LEAD	3	0.00E 0 / 61.40E 0	14.3 :V	36 :V	33.8 :V	28.2 :V
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	1750 :V	2070 :V	2030 :V	2590 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	176 :V	232 :V	203 :V	207 :V
MERCURY	0.2	8.23E 1 / 0.20E 0	.11 B:V	.075 B:V		.053 B:V
NICKEL	40	5.49E 3 / 26.90E 0	15.8 :V	11.4 :V	9.2 :V	17.9 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	1160 :V	1390 :V	1360 :V	1130 :V
SELENIUM	5	1.37E 3 / 1.40E 0	.85 B:JA			.67 B:JA
SILVER	10	1.37E 3 / 10.00E 0	2.3 :JA	1.4 B:JA	1.5 B:JA	.94 B:JA
SODIUM	5000	0.00E 0 / 1108.00E 0	88.2 B:V	202 B:V	149 B:V	208 B:V
VANADIUM	50	1.92E 3 / 55.60E 0	42.2 :V	24.9 :V	23.5 :V	31.7 :V
ZINC	20	8.23E 4 / 86.60E 0	115 :V#	225 :V#	231 :V#	147 :V#
Test Group:WQPL Units: µg/g						
CYANIDE	0.5	5.49E 6 / 0.00E 0			2.5 :V	

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BKGND = Background concentration (DOE 1994c)
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
RBC = Risk-Based Concentration
µg/g = microgram per gram
V = Validation Qualifier: valid data
* = Indicates compound exceeds RBC
** = All samples reported with positive results; no nondetects reported
# = Indicates compound exceeds background
- = There is no RBC for that compound

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TABLE 3-26
Surface-Soil Positive Results Data Summary
OU10 - IHSS 208

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
Test Group:METADD Units:mg/kg												
LITHIUM	100	**	**	**	**	4.7 B:J	SS014093 (1)	6.9 B:J	SS013893 (1)	3	3	5.8333
MOLYBDENUM	200	3.8	SS013993 (1)	3.9	SS014093 (1)	4.6 B:V	SS013893 (1)	4.6 B:V	SS013893 (1)	1	3	2.8167
STRONTIUM	200	**	**	**	**	15.1 B:J	SS013893 (1)	17.7 B:J	SS014093 (1)	3	3	16.2667
Test Group:SMETCLP Units:mg/kg												
ALUMINUM	200	**	**	**	**	5310 :V	SS014093 (1)	12700 :V	SS013893 (1)	3	3	8146.667
ARSENIC	10	**	**	**	**	3.7 :V	SS014093 (1)	8.6 :V	SS013893 (1)	3	3	5.5333
BARIUM	200	**	**	**	**	49.3 :V	SS014093 (1)	72.9 :V	SS013893 (1)	3	3	61.5333
BERYLLIUM	5	**	**	**	**	.48 B:V	SS014093 (1)	1.2 :V	SS013893 (1)	3	3	0.82
CALCIUM	5000	**	**	**	**	2950 :V	SS013993 (1)	3500 :V	SS014093 (1)	3	3	3156.667
CHROMIUM	10	**	**	**	**	13.6 :V	SS013993 (1)	15.2 :V	SS013893 (1)	3	3	14.2
COBALT	50	**	**	**	**	4.7 B:V	SS014093 (1)	12.6 :V	SS013893 (1)	3	3	7.9
COPPER	25	**	**	**	**	15.1 :V	SS013893 (1)	38.5 :V	SS013993 (1)	3	3	25.3333
IRON	100	**	**	**	**	10600 :V	SS014093 (1)	16300 :V	SS013893 (1)	3	3	12666.67
LEAD	3	**	**	**	**	14.3 :V	SS013893 (1)	36 :V	SS013993 (1)	3	3	26.1667
MAGNESIUM	5000	**	**	**	**	1750 :V	SS013893 (1)	2590 :V	SS014093 (1)	3	3	2136.667
MANGANESE	15	**	**	**	**	176 :V	SS013893 (1)	232 :V	SS013993 (1)	3	3	205
MERCURY	0.2	**	**	**	**	.053 B:V	SS014093 (1)	.11 B:V	SS013893 (1)	3	3	0.0793
NICKEL	40	**	**	**	**	11.4 :V	SS013993 (1)	17.9 :V	SS014093 (1)	3	3	15.0333
POTASSIUM	5000	**	**	**	**	1130 :V	SS014093 (1)	1390 :V	SS013993 (1)	3	3	1226.667
SELENIUM	5	0.54	SS013993 (1)	0.54	SS013993 (1)	.67 B:J	SS014093 (1)	.85 B:J	SS013893 (1)	2	3	0.5967
SILVER	10	**	**	**	**	.94 B:J	SS014093 (1)	2.3 :J	SS013893 (1)	3	3	1.58
SODIUM	5000	**	**	**	**	88.2 B:V	SS013893 (1)	208 B:V	SS014093 (1)	3	3	166.0667
VANADIUM	50	**	**	**	**	24.9 :V	SS013993 (1)	42.2 :V	SS013893 (1)	3	3	32.9333
ZINC	20	**	**	**	**	115 :V	SS013893 (1)	231 :V	SS013993 (1)	3	3	164.3333
Test Group:WQPL Units:µg/g												
CYANIDE	0.5	0.5	SS014093 (1)	0.56	SS013893 (1)	2.5 :V	SS013993 (1)	2.5 :V	SS013993 (1)	1	3	1.01

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BKGND = Background concentration (DOE 1994c)
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
RBC = Risk-Based Concentration
V = Validation Qualifier: valid data

µg/g = microgram per gram
* = Indicates compound exceeds RBC
** = All samples reported with positive results; no nondetects reported
# = Indicates compound exceeds background
- = There is no RBC for that compound

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diesel fuel, solvents, and metal scraps; and fiberglass resins and catalysts. A steel cargo container is situated within the IHSS. A 10-foot by 20-foot area adjacent to and east of the container is roped off.

The site has been used for several years to store drummed hazardous waste generated from paint work, automotive work, and machine work performed in Building 980. Drum storage ceased in May 1988 and all hazardous waste inventory was removed. IHSS 210 is currently used as a 90-day storage unit.

There are no historical analytical data for environmental media at IHSS 210.

3.14.1 High Purity Germanium Survey

The HPGe survey data for the sole survey location within IHSS 210 provided no evidence to suspect anomalous activities for potassium-40, radium-226, thorium-232, uranium-235, uranium-238, americium-241, or plutonium-239 at IHSS 210. The HPGe location for IHSS 210 is illustrated on Plate 1, the Americium Specific Activity Map.

3.14.2 Surface-Soil Sampling

Ten surface-soil samples were collected at IHSS 210: six along the perimeter of the maximum areal extent of the container area, two in the middle of the IHSS, one north of the site, and one south of the site. No duplicate samples were collected. Sample locations are shown in Figure 3-20. The complete analytical data set for the site is included in Appendix B. Table 3-27 provides positive results for the various sample points and Table 3-28 provides summary information for site data. Surface-soil data for IHSS 210 are also presented on Plate 8, which shows analytical results with reference to sample location points in IHSS 210 and IHSS 175.

TABLE 3-27
Surface-Soil Positive Results
OU10 - IHSS 210

Sample Location:			SS015193	SS015293	SS015393	SS015493	SS015593	SS015693	SS015793	SS015893	SS015993	SS016093
Sample Identification Number:			SSG1234JE	SSG1235JE	SSG1236JE	SSG1237JE	SSG1238JE	SSG1239JE	SSG1240JE	SSG1241JE	SSG1242JE	SSG1243JE
Date Sampled:			24-Feb-94	24-Feb-94	23-Feb-94	24-Feb-94	22-Feb-94	22-Feb-94	23-Feb-94	23-Feb-94	23-Feb-94	22-Feb-94
Test Group:BNACLP Units: µg/kg	MDL	RBC / BKGND										
1,2,4-TRICHLOROBENZENE	330	2.74E 6 / 0.00E 0								150 J:A		
1,4-DICHLOROBENZENE	330	2.67E 4 / 0.00E 0								110 J:A		
2,4-DIMETHYLPHENOL	330	5.49E 6 / 0.00E 0								58 J:A		
ACENAPHTHENE	330	1.65E 7 / 0.00E 0					120 J:A			68 J:A		
ANTHRACENE	330	8.23E 7 / 0.00E 0					160 J:A					
BENZO(a)ANTHRACENE	330	8.77E 2 / 0.00E 0					240 J:A			62 J:A	56 J:A	
BENZO(a)PYRENE	330	8.77E 1 / 0.00E 0					210 J:A*				58 J:A	
BENZO(b)FLUORANTHENE	330	8.77E 2 / 0.00E 0					320 J:A					
BENZO(k)FLUORANTHENE	330	8.77E 3 / 0.00E 0					120 J:A					
BIS(2-ETHYLHEXYL) PHTHALATE	330	4.57E 4 / 0.00E 0	460 B:V									
BUTYL BENZYL PHTHALATE	330	5.49E 7 / 0.00E 0					100 J:A					180 J:A
CHRYSENE	330	8.77E 4 / 0.00E 0					230 J:A				52 J:A	
DI-n-BUTYL PHTHALATE	330	2.74E 7 / 0.00E 0						74 J:A		180 J:A		
DIBENZOFURAN	330	0.00E 0 / 0.00E 0					50 J:A-					
FLUORANTHENE	330	1.10E 7 / 0.00E 0		37 J:A		47 J:A	610 :V	60 J:A		120 J:A	130 J:A	370 :JA
FLUORENE	330	1.10E 7 / 0.00E 0					110 J:A					
INDENO(1,2,3-cd)PYRENE	330	8.77E 2 / 0.00E 0					100 J:A					
NAPHTHALENE	330	1.10E 7 / 0.00E 0					72 J:A					
PHENANTHRENE	330	0.00E 0 / 0.00E 0					590 :V-			83 J:A-	63 J:A-	100 J:A-
PYRENE	330	8.23E 6 / 0.00E 0					690 B:JA		170 J:A	440 :V	120 J:A	
Test Group:METADD Units: mg/kg												
LITHIUM	100	0.00E 0 / 20.00E 0	7.3 B:JA	4 B:JA	6.3 B:JA	7.1 B:JA	4.7 B:JA	5.7 B:JA	4.7 B:JA	7.1 B:JA	7.2 B:JA	6.1 B:JA
STRONTIUM	200	1.65E 5 / 90.10E 0	32.7 B:JA	16.2 B:JA	12 B:JA	33.7 B:JA	14.4 B:JA	15.2 B:JA	10.4 B:JA	14.1 B:JA	36.7 B:JA	13.6 B:JA
Test Group:SMETCLP Units: mg/kg												
ALUMINUM	200	0.00E 0 / 21915.40E 0	6850 :V	3590 :V	6230 :V	6590 :V	4720 :V	5520 :V	3390 :V	6390 :V	7620 :V	6130 :V
ARSENIC	10	3.66E-1 / 12.90E 0	2.6 :V*	1.6 B:V*	2 B:V*	1.9 B:V*	2.9 :V*	3 :V*	2 B:V*	2.8 :V*	3.5 :V*	2.8 :V*
BARIUM	200	1.92E 4 / 528.00E 0	48.4 :V	40 B:V	57.5 :V	42.1 B:V	54.6 :V	63.3 :V	38.4 B:V	61.9 :V	72.1 :V	56 :V
BERYLLIUM	5	1.33E 0 / 5.20E 0	.33 B:V	.23 B:V	.35 B:V	.3 B:V	.2 B:V	.24 B:V	.23 B:V	.48 B:V	.54 B:V	.27 B:V
CADMIUM	5	1.37E 2 / 5.00E 0				.46 B:V	.49 B:V	3.6 :V	1.6 :V	1.4 :V	.52 B:V	1.1 :V
CALCIUM	5000	0.00E 0 / 13573.30E 0	10200 :V	8600 :V	3410 :V	6790 :V	6190 :V	5640 :V	1950 :V	6560 :V	24000 :V#	4210 :V
CHROMIUM	10	9.62E 2 / 24.80E 0	48.1 :V#	12.7 :V	16.4 :V	15.5 :V	21.3 :V	21.5 :V	10.6 :V	20.4 :V	16.8 :V	19.8 :V
COBALT	50	0.00E 0 / 24.80E 0	7.4 B:V	2.5 B:V	3.8 B:V	6.3 B:V	3.2 B:V	4.2 B:V	2.4 B:V	4.4 B:V	5.4 B:V	4.3 B:V
COPPER	25	1.10E 4 / 27.30E 0	35.9 :JA#	10 :JA	15.3 :JA	76.3 :JA#	18.3 :V	22.5 :V	17.2 :JA	27 :JA	26.8 :JA	31.5 :V#
IRON	100	0.00E 0 / 28160.40E 0	19700 :V	7090 :V	10600 :V	15700 :V	10300 :V	16700 :V	7820 :V	12200 :V	12700 :V	14100 :V
LEAD	3	0.00E 0 / 61.40E 0	26.8 :V	26.9 :V	14.3 :V	15.5 :V	25.9 :JA	39.3 :JA	19.9 :V	40.5 :V	25.7 :V	41.9 :JA
MAGNESIUM	5000	0.00E 0 / 7011.50E 0	4370 :V	1330 :V	2040 :V	4000 :V	1640 :V	1860 :V	1310 :V	2150 :V	3140 :V	1950 :V
MANGANESE	15	1.37E 3 / 2253.50E 0	333 :V	109 :V	132 :V	273 :V	132 :JA	173 :JA	115 :V	174 :V	204 :V	188 :JA
MERCURY	0.2	8.23E 1 / 0.20E 0									.07 B:V	
NICKEL	40	5.49E 3 / 26.90E 0	43.5 :V#	10.5 :V	10.4 :V	12.2 :V	16.3 :V	13 :V	8.2 B:V	14.1 :V	18.4 :V	21.8 :V
POTASSIUM	5000	0.00E 0 / 5256.80E 0	1560 :V	1130 :V	1820 :V	1520 :V	1430 :V	1550 :V	1090 :V	1970 :V	1880 :V	1670 :V
SILVER	10	1.37E 3 / 10.00E 0						.97 B:JA				.64 B:JA
SODIUM	5000	0.00E 0 / 1108.00E 0	1360 :V#	535 B:V	548 B:V	1400 :V#			457 B:V	452 B:V	751 B:V	
VANADIUM	50	1.92E 3 / 55.60E 0	27.5 :V	11.6 :V	18.1 :V	26.5 :V	14.7 :V	16.7 :V	11.2 :V	19.8 :V	22.7 :V	18.1 :V
ZINC	20	8.23E 4 / 86.60E 0	73.9 I:JA	36.2 I:JA	28.3 I:JA	67.1 I:JA	110 :V#	98.5 :V#	311 I:JA#	149 I:JA#	82.1 I:JA	108 :V#

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
BKGND = Background concentration (DOE 1994c)
J = Laboratory Qualifer: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram

RBC = Risk-Based Concentration
V = Validation Qualifier: valid data
µg/kg = microgram per kilogram
* = Indicates compound exceeds RBC
# = Indicates compound exceeds background
- = There is no RBC for that compound

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TABLE 3-28
Surface-Soil Positive Results Data Summary
OU10 - IHSS 210

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
Test Group:BNACLP Units: µg/kg												
1,2,4-TRICHLOROBENZENE	330	350	SS015193 (1)	370	SS015493 (2)	150 J:A	SS015893 (1)	150 J:A	SS015893 (1)	1	10	177.5
1,4-DICHLOROBENZENE	330	350	SS015193 (1)	370	SS015493 (2)	110 J:A	SS015893 (1)	110 J:A	SS015893 (1)	1	10	173.5
2,4-DIMETHYLPHENOL	330	350	SS015193 (1)	370	SS015493 (2)	58 J:A	SS015893 (1)	58 J:A	SS015893 (1)	1	10	168.3
ACENAPHTHENE	330	350	SS015193 (1)	370	SS015493 (2)	68 J:A	SS015893 (1)	120 J:A	SS015593 (1)	2	10	163.3
ANTHRACENE	330	350	SS015193 (1)	370	SS015493 (3)	160 J:A	SS015593 (1)	160 J:A	SS015593 (1)	1	10	179
BENZO(a)ANTHRACENE	330	350	SS015193 (1)	370	SS015493 (1)	56 J:A	SS015993 (1)	240 J:A	SS015593 (1)	3	10	161.8
BENZO(a)PYRENE	330	350	SS015193 (1)	370	SS015493 (2)	58 J:A	SS015993 (1)	210 J:A	SS015593 (1)	2	9	170.3333
BENZO(b)FLUORANTHENE	330	350	SS015193 (1)	370	SS015493 (3)	320 J:A	SS015593 (1)	320 J:A	SS015593 (1)	1	9	196.6667
BENZO(k)FLUORANTHENE	330	350	SS015193 (1)	370	SS015493 (3)	120 J:A	SS015593 (1)	120 J:A	SS015593 (1)	1	9	174.4444
BIS(2-ETHYLHEXYL) PHTHALATE	330	360	SS015393 (5)	390	SS015293 (1)	460 B:V	SS015193 (1)	460 B:V	SS015193 (1)	1	10	211
BUTYL BENZYL PHTHALATE	330	350	SS015193 (1)	370	SS015493 (3)	100 J:A	SS015593 (1)	180 J:A	SS016093 (1)	2	10	173
CHRYSENE	330	350	SS015193 (1)	370	SS015493 (2)	52 J:A	SS015993 (1)	230 J:A	SS015593 (1)	2	10	172.7
DI-n-BUTYL PHTHALATE	330	350	SS015193 (1)	370	SS015493 (2)	74 J:A	SS015693 (1)	180 J:A	SS015893 (1)	2	10	169.9
DIBENZOFURAN	330	350	SS015193 (1)	370	SS015493 (3)	50 J:A	SS015593 (1)	50 J:A	SS015593 (1)	1	10	168
FLUORANTHENE	330	350	SS015193 (1)	360	SS015393 (2)	37 J:A	SS015293 (1)	610 :V	SS015593 (1)	7	10	190.9
FLUORENE	330	350	SS015193 (1)	370	SS015493 (3)	110 J:A	SS015593 (1)	110 J:A	SS015593 (1)	1	10	174
INDENO(1,2,3-cd)PYRENE	330	350	SS015193 (1)	370	SS015493 (3)	100 J:A	SS015593 (1)	100 J:A	SS015593 (1)	1	9	172.2222
NAPHTHALENE	330	350	SS015193 (1)	370	SS015493 (3)	72 J:A	SS015593 (1)	72 J:A	SS015593 (1)	1	10	170.2
PHENANTHRENE	330	350	SS015193 (1)	370	SS015493 (1)	63 J:A	SS015993 (1)	590 :V	SS015593 (1)	4	10	191.6
PYRENE	330	350	SS015193 (1)	370	SS015493 (1)	120 J:A	SS015993 (1)	690 B:J	SS015593 (1)	4	10	250
Test Group:METADD Units: mg/kg												
LITHIUM	100	**	**	**	**	4 B:J	SS015293 (1)	7.3 B:J	SS015193 (1)	10	10	6.02
STRONTIUM	200	**	**	**	**	10.4 B:J	SS015793 (1)	36.7 B:J	SS015993 (1)	10	10	19.9
Test Group:PESTCLP Units: µg/kg												
Test Group:SMETCLP Units: mg/kg												
ALUMINUM	200	**	**	**	**	3390 :V	SS015793 (1)	7620 :V	SS015993 (1)	10	10	5703
ARSENIC	10	**	**	**	**	1.6 B:V	SS015293 (1)	3.5 :V	SS015993 (1)	10	10	2.51
BARIUM	200	**	**	**	**	38.4 B:V	SS015793 (1)	72.1 :V	SS015993 (1)	10	10	53.43
BERYLLIUM	5	**	**	**	**	.2 B:V	SS015593 (1)	.54 B:V	SS015993 (1)	10	10	0.317
CADMIUM	5	0.35	SS015193 (1)	0.37	SS015293 (1)	.46 B:V	SS015493 (1)	3.6 :V	SS015693 (1)	7	10	0.971
CALCIUM	5000	**	**	**	**	1950 :V	SS015793 (1)	24000 :V	SS015993 (1)	10	10	7755
CHROMIUM	10	**	**	**	**	10.6 :V	SS015793 (1)	48.1 :V	SS015193 (1)	10	10	20.31
COBALT	50	**	**	**	**	2.4 B:V	SS015793 (1)	7.4 B:V	SS015193 (1)	10	10	4.39
COPPER	25	**	**	**	**	10 :J	SS015293 (1)	78.3 :J	SS015493 (1)	10	10	28.08
IRON	100	**	**	**	**	7090 :V	SS015293 (1)	19700 :V	SS015193 (1)	10	10	12691
LEAD	3	**	**	**	**	14.3 :V	SS015393 (1)	41.9 :J	SS016093 (1)	10	10	27.67
MAGNESIUM	5000	**	**	**	**	1310 :V	SS015793 (1)	4370 :V	SS015193 (1)	10	10	2379
MANGANESE	15	**	**	**	**	109 :V	SS015293 (1)	333 :V	SS015193 (1)	10	10	183.3
MERCURY	0.2	0.05	SS015493 (1)	0.06	SS015893 (1)	.07 B:V	SS015993 (1)	.07 B:V	SS015993 (1)	1	10	0.0304
NICKEL	40	**	**	**	**	8.2 B:V	SS015793 (1)	43.5 :V	SS015193 (1)	10	10	16.84
POTASSIUM	5000	**	**	**	**	1090 :V	SS015793 (1)	1970 :V	SS015893 (1)	10	10	1562

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TABLE 3-28
Surface-Soil Positive Results Data Summary
OU10 - IHSS 210

	MDL	SQL Minimum Value	SQL Minimum Location *	SQL Maximum Value	SQL Maximum Location *	Minimum Concentration	Minimum Concentration Location *	Maximum Concentration	Maximum Concentration Location *	Number of Detects	Total Number of Samples	Average Concentration
SILVER	10	0.44	SS015193 (1)	0.63	SS015493 (1)	.64 B:J	SS016093 (1)	.97 B:J	SS015693 (1)	2	10	0.352
SODIUM	5000	265	SS015693 (1)	282	SS016093 (1)	452 B:V	SS015893 (1)	1400 :V	SS015493 (1)	7	10	591.2
VANADIUM	50	**	**	**	**	11.2 :V	SS015793 (1)	27.5 :V	SS015193 (1)	10	10	18.69
ZINC	20	**	**	**	**	28.3 I:J	SS015393 (1)	311 I:J	SS015793 (1)	10	10	106.41

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
B = Laboratory Qualifier: detected in blank
J = Laboratory Qualifier: estimated value
MDL = Method Detection Limit
mg/kg = milligram per kilogram
V = Validation Qualifier: valid data
SQL = Sample Quantitation Limit
µg/kg = microgram per kilogram
* = The number of sample locations at that value is shown in parentheses
** = All samples reported with positive results; no nondetects reported

Forty-two analytes were detected including 20 organics and 22 inorganics. Most of the organics were detected only once or twice. Fluoranthene was the most frequently detected organic and was found at seven of 10 locations. Phenanthrene and pyrene were detected at four locations in the IHSS area. Benzo(a)anthracene was detected at three of 10 locations. The remaining organics were detected less frequently. PAHs were detected at all locations except for location SS015193, north of IHSS 210.

Inorganics exceeding background at IHSS 210 included calcium, chromium, copper, nickel, sodium, and zinc. However, none of the metals exceeded risk-based levels. Chromium exceeded background only at location SS015193, north of the site, where it was detected at more than twice the background level. Copper levels only slightly exceeded background except at one location, but copper was detected at almost three times background at SS015493, in the middle of the site. Sodium, nickel, and calcium were detected above background at only a few locations. Zinc levels were greater than background at one-half the locations sampled.

3.14.3 Soil-Gas Survey

The soil-gas sampling was conducted on a 20-foot grid. Ten locations were sampled. Figure 3-21 presents the locations of soil-gas samples. Concentrations of target VOCs equal to or exceeding the target detection limit of 1.0 μg/L (Section 3.13) are listed in Table 3-29 and are illustrated on Plate 9.

On the east side of IHSS 210, ethylbenzene was detected in a concentration of 2.80 μg/L. Xylenes were detected in concentrations of 9.80 μg/L for Total xylenes. These compounds were all detected at the same location, SG037794.

TABLE 3-29
Target Analytes for OU10 - IHSS 210
Soil-Gas Environmental Samples
(Concentrations Above Target Detection Levels for 14 Chemicals of Concern[1])

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE DATE	SAMPLE TYPE	ANALYTE	RESULT	UNIT	LAB QUALIFIER	DETECTION LIMIT
SG037194	SGG0371JE	08/03/94	REAL	Methane	40.00	ppm		20.00
SG037294	SGG0372JE	08/03/94	REAL	Methane	20.00	ppm		20.00
SG037394	SGG0373JE	08/03/94	REAL	Methane	50.00	ppm		20.00
SG037494	SGG0374JE	08/03/94	REAL	Total Xylenes	6.00	µg/L		0.02
				Methane	10.00	ppm		20.00
SG037594	SGG0375JE	08/03/94	REAL	Methane	60.00	ppm		20.00
SG037694	SGG0376JE	08/03/94	REAL	Methane	10.00	ppm		20.00
SG037794	SGG0377JE	09/08/94	REAL	Ethylbenzene	2.80	µg/L		0.10
				Methane	10.00	ppm		20.00
				Total Xylenes	9.80	µg/L		0.20
SG037894	SGG0378JE	08/03/94	REAL	Methane	30.00	ppm		20.00
SG038094	SGG0380JE	8/3/94	REAL	Methane	10.00	ppm		20.00

Notes:

1) The target detection level of 1.0 mg/L applies to the following chemicals of concern: 1,1,1-trichloroethane, 2-butanone, acetone, benzene, carbon tetrachloride, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, cis-1,2-dichloroethene, and xylenes.

The field instrument detection level for hydrogen sulfide is 5 ppm.
The field instrument detection level for methane is 20 ppm.
Reported values of 10 ppm are estimated (see Section 3.1.3).

ppm = part per million
Real = Environmental sample
µg/L = microgram per liter

On the western side of IHSS 210, one location (SG037494) exhibited xylene compounds. Total xylenes were detected in concentrations of 6.0 μg/L.

Methane was observed at nine of the 10 locations sampled at IHSS 210. Methane concentrations ranged from a minimum of 10 ppm at four locations to a maximum of 60 ppm at one location. These low-level concentrations of methane are well below methane levels measured in the OU7 landfill of OU10 (DOE 1994d) and may be attributed to natural organic decay.

3.15 IHSS 213 - UNIT 15, 904 PAD PONDCRETE STORAGE

IHSS 213, 904 Pad Pondcrete Storage, is an interim storage facility used to store low-level mixed waste resulting from the solidification of Solar Evaporation Ponds sludge and sediment with portland cement. The location of the IHSS is presented in Figure 3-22. A detailed background of this IHSS is discussed in Section 2 of the *OU10 RFI/RI Work Plan* (DOE 1992a). IHSS 213 is an active waste storage unit and therefore is a potential source of contamination. Nonintrusive sampling will not be conducted until the storage facility becomes inactive.

Although no surface-soil sampling or soil-gas surveys were conducted at this IHSS, HPGe data were available for this site as a part of an overall plant-site survey. HPGe data were also generated because of concern over possible plutonium and americium contamination near OU1 and OU2.

3.15.1 High Purity Germanium Survey

The HPGe survey data for the eight survey locations within IHSS 213 provided no evidence of elevated activities for potassium-40, radium-226, thorium-232, uranium-238, or plutonium-239 at IHSS 213. However, potentially elevated activities for uranium-235 and americium-241 were identified at locations 4A, 4B, and 4C; at locations 3Z, 4D, 4E, and 4F, only americium-241 appeared elevated. However, these sample locations are all within 50 feet of the 904 Pad. Mixed low-level radioactive waste is stored on the 904 Pad and likely contain considerable concentrations of americium-241 and uranium-235. Thus, these locations are discounted as likely due to "shine" from contaminated waste at the 904 Pad. HPGe locations for IHSS 213 are illustrated on Plate 1, the Americium Specific Activity Map.

3.16 IHSS 214 - UNIT 25, 750 PAD PONDCRETE AND SALTCRETE STORAGE

IHSS 214, 750 Pad Pondcrete and Saltcrete Storage, is an interim storage facility used to store low-level mixed waste resulting from the solidification of Solar Evaporation Ponds sludge and sediment with portland cement. The location of the IHSS is presented in Figure 3-23. A detailed background of this IHSS is discussed in Section 2 of the *OU10 RFI/RI Work Plan* (DOE 1992a).

IHSS 214 is an active waste storage unit and therefore is a potential source of contamination. Nonintrusive sampling will not be conducted until the storage facility becomes inactive.

3.16.1 High Purity Germanium Survey

The HPGe survey data for the 18 locations within IHSS 214 provided no evidence of elevated activities for potassium-40, radium-226, thorium-232, uranium-238, or plutonium-239 at IHSS 214. However, potentially elevated activities for uranium-235 and americium-241 were identified at location 5N. Americium-241 appeared elevated at 12 additional locations. However, these sample locations are very close to each other, and they are also within 100 feet of the 750 Pad. Pondcrete, a mixed low-level radioactive waste, is stored on the 750 Pad and can contain considerable concentrations of americium-241, uranium-235, and other radionuclides. Thus, these locations are not suspected of having anomalous activity because the survey results may have been influenced by "shine" from the 750 Pad. HPGe locations for IHSS 214 are illustrated on Plate 1, the Americium Specific Activity Map.

4.0 STATISTICAL ASSESSMENT OF SURFACE-SOIL DATA

Phase I, Stage 1 surface-soil sampling at the various IHSSs was based in part on a preliminary statistical analysis of data from some parts of OU10. Preliminary estimates of the numbers of physical samples needed to estimate mean values of chemicals throughout each IHSS were derived based on assumptions regarding the distributions of data within each IHSS. Those assumptions were based in part on the observed variability (expressed in terms of the coefficient of variation) of previous data collected from some of the IHSSs. Based on that observed variability, a preliminary estimate of 0.59 for the coefficient of variation (ratio of standard deviation to mean) was used to estimate the numbers of samples required from each IHSS (DOE 1992a). The analysis indicated that 25 samples would be required from each IHSS to reliably estimate the mean concentration of a chemical within the IHSS if the coefficient of variability were less than or equal to 0.59. In general, based on this analysis, a minimum of 25 soil samples were collected from each of the larger IHSSs; a minimum of eight soil samples were collected from each of the smaller IHSSs (DOE 1992a).

Because Phase I, Stage 1 soil data have now been obtained, it is possible to more thoroughly investigate the variability of data within each IHSS and, specifically, examine whether the number of soil samples collected was sufficient to reliably estimate mean concentrations of chemicals within each IHSS. For cases where the numbers of samples collected during Phase I, Stage 1 are not sufficient to estimate mean concentrations with the desired degree of confidence, plans for collecting additional samples during Phase I, Stage 2 investigations can be developed. These activities are described in Section 6.0.

The assessment of Phase I, Stage 1 data has involved two steps: data screening and parametric statistical computations. The data assessment also includes conclusions regarding the sufficiency of the Phase I, Stage 1 data for each IHSS.

4.1 DATA SCREENING

To perform an assessment of the Phase I, Stage 1 data with respect to the sufficiency of the number of samples, the data were screened through a hierarchy of processes:

1. First, duplicates (i.e., concentrations for duplicate samples collected from the same nominal location) were treated in a manner consistent with that of the risk assessment. If both analyses indicated detected concentrations, the higher value was used to represent the concentration at the location. If one analysis indicated a detected concentration and the other analysis was below the detection level, the detected value was used to represent the concentration at the location. If both analyses were below the detection level, the value with the lower detection level was used to represent the concentration at that location.

2. Second, the frequency of detections for each chemical was examined. For those chemicals for which all analytical results were less than the SQL, no further assessment was performed because no parametric statistical computations are possible with such data. Furthermore, TICs were not addressed in this assessment.

3. Third, for those chemicals for which more than approximately one-third of the analytical results were less than the detection level, no parametric statistical computations were conducted. However, in Section 3.0, the detected data were examined for consistency with trends observed from more complete data sets (e.g., presence of "hot spots").

4. In several instances, primarily for semivolatile organic compound (SVOC) analyses, a large proportion of the data was reported as estimated detections below the SQL, whereas the nondetected data were reported with SQLs an order of magnitude or more greater than the estimated detections. Typically, when a data set includes both detected values

and values less than detection level, an unbiased estimate of the mean can be obtained by replacing the nondetected values with one-half the detection level (Gilbert 1987). This approach is not useful when the detection levels are an order of magnitude higher than the estimated detections. Consequently, parametric statistical computations were not performed for these data sets.

5. For data sets that included fewer than approximately one-third nondetects, and reported detected values that generally exceeded the detection levels for the nondetected data, parametric statistical computations were conducted by replacing the nondetected values with one-half the detection level (SQL) to obtain unbiased estimates of the means of the data distributions. Although RCRA guidance suggests that non-parametric methods be used to compare site data against standards whenever the frequency of nondetects exceeds 15 percent (EPA 1989), the present approach is consistent with RFETS data treatment for risk assessment. At this preliminary stage, the data are not being compared against standards. Furthermore, the draft *Human Health Risk Assessment Methodology* (EG&G 1994a) indicates that nondetected values should be replaced with one-half the reported detection limit, and that graphical presentations of the data using box plots and histograms should be used when the percentage of nondetected values is 50 percent or less. In addition, recent information (EG&G 1994b) suggests that simple substitution methods, such as replacing nondetected values with one-half the detection level, are nearly as accurate as the generally-preferred Maximum Likelihood Estimation (MLE) method for dealing with nondetected values when the proportion of nondetected values is less than 80 percent.

6. For data sets for which all values were reported as detected (even if qualified as only estimated for some quality assurance [QA]/QC or data validation reason), the entire data set was used for parametric statistical computation as described in the following sections.

The only data that were excluded from the analyses were those data that were reported as "rejected" by the data validation process.

The application of each of these screening steps is presented in the following IHSS-specific discussions.

4.2 PARAMETRIC STATISTICAL COMPUTATIONS

For those data sets that were not eliminated from further analyses by the screening process described in Section 4.1, the following statistical computations were conducted:

1. The number of samples, mean, standard deviation, and coefficient of variation (ratio of standard deviation to mean) were calculated.

2. The number of samples required was then calculated in a manner consistent with that used in the Work Plan (DOE 1992a). The formula used is presented by Gilbert (1987):

$n(\alpha, d)$	=	$(Z_{1-\alpha/2}\eta/d)^2$, where
$n(\alpha, d)$	=	number of measurements required (sample size),
$Z_{1-\alpha/2}$	=	is the standard normal deviate that cuts off (100 $\alpha/2$) percent of the upper tail of a standard normal distribution,
η	=	coefficient of variation, and
d	=	relative error = $\lvert\bar{x} - \mu\rvert/\mu$, where $\bar{x}$ is the sample mean (mean of the observed data) and μ is the true population mean, such that Prob[$\lvert\bar{x} - \mu\rvert \geq d\mu$] = α.

3. The quantity $n(\alpha, d)$ can also be interpreted as the number of samples needed to ensure that

   $$\text{Prob}[\ |\bar{x} - \mu|\ < d\mu] = 1 - \alpha, \text{ or}$$

   $$\text{Prob}[\bar{x}/(1 + d) < \mu < \bar{x}/(1 - d)] = 1 - \alpha.$$

   That is, if the number of samples is at least equal to $n(\alpha, d)$, then the probability is $1 - \alpha$ that the true mean of the data distribution is less than the sample mean (mean of the number of samples collected) divided by $1 - d$.

4. In the *OU10 RFI/RI Work Plan* (DOE 1992a), α and d were chosen, respectively, to be 0.05 and 0.2. For data sets with relatively large variance, due either to a high degree of data variability or a small number of samples, these values can produce a large estimate of the required number of samples, $n(\alpha, d)$. To provide further information to aid in selecting numbers of additional samples needed during Phase I, Stage 2, the number of required samples, $n(\alpha, d)$ was also calculated for values of α ranging from 0.05 to 0.2, and values of the relative error, d, ranging from 0.2 to 0.5. That is, the sensitivity of the calculated numbers of samples to the selection of the confidence level and the relative error was assessed. For example, if the number of physical samples collected is greater than or equal to $n(0.05, 0.2)$, then the statistical constraints of the Work Plan (DOE 1992a) have been met. However, if the number of physical samples collected is less than $n(\alpha, d)$ except for, say, the case $\alpha = 0.2$ and $d = 0.5$, then we can conclude that the number of physical samples is sufficient for $\alpha = 0.2$ and $d = 0.5$. That is, the number of physical samples is sufficient if we can accept an 80 percent confidence that the true population mean is less than twice the sample mean.

   This sensitivity analysis can be used to identify appropriate confidence levels and relative error rates, per constituent and per IHSS, to achieve protectiveness within practical constraints on the numbers of Phase I, Stage 2 field samples that must be collected. In some cases, the sensitivity analysis may indicate that the numbers of samples already collected are sufficient to characterize the mean concentrations within the IHSS, or are sufficient so long as confidence and relative error requirements can be relaxed slightly. The analysis may also identify constituents with such high data variability that they must be assessed more thoroughly before any conclusions can be made regarding the numbers of field samples required.

Results of these analyses are discussed on an IHSS-specific basis in the following sections. The conclusions of this statistical assessment are used in Section 6.0 and will be referred to during the development of the Phase I, Stage 2 Work Plan. In that Work Plan, numbers and locations of additional samples will be recommended to meet what appear to be appropriate and protective statistical assumptions.

4.3 DATA ASSESSMENT CONCLUSIONS

This section presents conclusions regarding the sufficiency of Phase I, Stage 1 surface-soil data for estimating means of chemical concentrations. The results are presented on an IHSS-specific basis.

4.3.1 IHSS 129 - Oil Leak

This section will be completed when the data are available. Table 4-1 will provide a statistical summary of surface-soil data for IHSS 129.

4.3.2 IHSS 170 - Property Utilization and Disposal Storage Yard

Most of the SVOCs were not detected in surface-soil samples from IHSS 170. However, a few PAHs, phthalates, and other compounds were detected: 4-chloro-3-methylphenol, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene,

TABLE 4-1 Statistical Summary Phase I, Stage 1 Surface-Soil of Data for IHSS 129

(To be prepared when data are available.)

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benzo(k)fluoranthene, benzoic acid, bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, chrysene, di-n-butyl phthalate, di-n-octyl phthalate, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. The pesticides 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane (4,4'-dichlorodiphenyltrichloroethane [DDT]), heptachlor epoxide, and beta-5-5 benzene hexachloride (BHC) were each detected in only one sample, and the PCB Aroclor-1254 was detected in two samples. As expected, metals were detected in most or all samples. Only cesium, antimony, selenium, and thallium were not detected in any sample. Cyanide was not detected in any surface-soil sample.

For the SVOCs that were detected, all except five were either detected in fewer than one-third of the samples or were estimated at levels substantially lower than the detection levels for the majority of the data for that compound. The statistical assessment was completed for the other five chemicals: benzo(b)fluoranthene, bis(2-ethylhexyl) phthalate, fluoranthene, phenanthrene, and pyrene. The pesticides and/or PCBs were detected in only one or two of 35 samples; consequently, none of them were carried forward through the statistical assessment. Of the metals that were detected, molybdenum, tin, mercury, silver, and sodium were detected in only two to eight of the 35 samples so they were not carried forward through the statistical assessment.

Statistical summaries of the data for the remaining chemicals are provided in Table 4-2. For $\alpha = 0.05$ and $d = 0.2$, the numbers of samples collected during Phase I, Stage 1 are sufficient for 11 of the metals. However, if the statistical constraints are relaxed slightly, to $\alpha = 0.1$ and $d = 0.3$, then the number of samples collected are sufficient for benzo(b)fluoranthene and for all of the metals except lithium, cadmium, chromium, and nickel.

For bis(2-ethylhexyl) phthalate, the number of samples collected is sufficient for $\alpha = 0.2$ and $d = 0.5$ (Table 4-2). Thus, the number of samples is sufficient if we can accept an 80 percent

TABLE 4-2

Statistical Summary of Phase I, Stage 1 Surface-Soil Data for IHSS 170

Semivolatiles (µg/kg)	Mean	Standard Deviation	η	N	n(.05, .2)	n(.1, .2)	n(.05, .3)	n(.1, .3)	n(.1, .5)	n(.2, .5)
Benzo(b)fluoranthene	223.65	150.18	0.672	31	43	31	19	14	5	3
Bis(2-ethylhexyl)phthalate	395.71	840.49	2.124	35	433	305	193	136	49	30
Fluoranthene	277.94	323.03	1.162	35	130	91	58	41	15	9
Phenanthrene	210.20	269.25	1.281	35	158	111	70	49	18	11
Pyrene	285.63	315.52	1.105	35	117	83	52	37	13	8
Metals (mg/kg)										
Lithium	10.39	12.66	1.218	35	143	100	63	45	16	10
Strontium	14.99	3.43	0.229	35	5	4	2	2	1	0
Aluminum	8475.71	2476.60	0.292	35	8	6	4	3	1	1
Arsenic	4.55	1.92	0.421	35	17	12	8	5	2	1
Barium	88.39	23.52	0.266	34	7	5	3	2	1	0
Beryllium	0.44	0.17	0.376	35	14	10	6	4	2	1
Cadmium	1.26	2.13	1.690	35	274	193	122	86	31	19
Calcium	3949.71	3588.53	0.909	35	79	56	35	25	9	5
Chromium	18.39	20.91	1.137	35	124	87	55	39	14	8
Cobalt	7.26	3.92	0.540	35	28	20	12	9	3	2
Copper	27.44	23.49	0.856	35	70	50	31	22	8	5
Iron	15639.14	8311.83	0.531	35	27	19	12	8	3	2
Lead	36.57	28.91	0.790	35	60	42	27	19	7	4
Magnesium	3307.71	2702.82	0.817	35	64	45	29	20	7	4
Manganese	377.40	213.24	0.565	35	31	22	14	10	3	2
Nickel	14.94	19.70	1.318	35	167	118	74	52	19	11
Potassium	2690.57	1119.43	0.416	35	17	12	7	5	2	1
Vanadium	29.79	12.39	0.416	35	17	12	7	5	2	1
Zinc	89.07	47.33	0.531	35	27	19	12	8	3	2

<u>Notes:</u>

η = coefficient of variation
N = number of Phase I, Stage 1 samples
n(α, d) = number of samples required for a probability α that the relative error in the estimate of the mean is ≥ d.
[shaded] = n(α, d) > N
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

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confidence that the true population mean is less than twice the sample mean of 395.71 μg/kg. Because twice the sample mean is still almost two orders of magnitude less than the RBC for this compound (Section 3.1), accepting a lower confidence level of 80 percent and a larger relative error of the mean of 0.5 is not unreasonable. For fluoranthene, phenanthrene, and pyrene, the number of samples collected is sufficient for $\alpha = 0.1$ and $d = 0.5$ (Table 4-2). Thus the number of samples collected is sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean of 277.94 μg/kg for fluoranthene, 210.2 μg/kg for phenanthrene, and 285.63 μg/kg for pyrene. A value of 555.88 μg/kg for fluoranthene is more than four orders of magnitude less than the RBC, and a value of 571.26 μg/kg for pyrene is more than three orders of magnitude less than the RBC.

For phenanthrene, there is no RBC, so twice the sample mean cannot be compared against the RBC. Therefore, we have no basis for concluding that relaxing the statistical parameters for phenanthrene is reasonable. However, given the similarities in statistical properties among phenanthrene, fluoranthene, and pyrene (Table 4-2), and the fact that phenanthrene is a noncarcinogenic PAH like fluoranthene and pyrene, it is probable that sufficient data have been collected to characterize the mean distribution of phenanthrene for $\alpha = 0.1$ and $d = 0.5$. Thus, it can be reasonably concluded that the number of surface soil samples collected from IHSS 170 is sufficient to reasonably characterize the mean values of all SVOCs, except possibly phenanthrene, within the IHSS.

Similarly, for lithium, cadmium, chromium, and nickel, the number of samples collected is sufficient for $\alpha = 0.1$ and $d = 0.5$ (Table 4-2). Thus, the number of samples is sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean of 10.39 mg/kg for lithium, 1.26 mg/kg for cadmium, 18.39 mg/kg for chromium, and 14.94 mg/kg for nickel. A value of 20.78 mg/kg for lithium is only slightly greater than the background $UTL_{99/99}$ of 20 mg/kg (Section 3.1), but there is no RBC for lithium. A value of 2.52 mg/kg for cadmium is less than either the RBC of 137 mg/kg or the background

$UTL_{99/99}$ of 5.0 mg/kg (Section 3.1). A value of 36.78 mg/kg for chromium is slightly greater than the background $UTL_{99/99}$ of 24.8 mg/kg, but is well below the RBC of 962 mg/kg. A value of 29.88 mg/kg for nickel is also substantially less than the RBC of 5,490 mg/kg and only slightly greater than the background UTL of 26.9 mg/kg (Section 3.1). Thus, accepting a lower confidence level of 90 percent and a larger relative error of the mean of 0.5 is not unreasonable for cadmium, chromium, or nickel. For lithium, there is no RBC, so we cannot compare twice the sample mean to the RBC. However, twice the sample mean is only slightly greater than the background $UTL_{99/99}$, and the lithium distribution is similar to those for chromium and nickel, so it is probable that sufficient data have been collected to characterize the mean distribution of lithium for $\alpha = 0.1$ and $d = 0.5$. Therefore, it can be concluded that the number of surface-soil samples collected from IHSS 170 is sufficient to reasonably characterize the mean values of the metals, except possibly lithium, within the IHSS.

4.3.3 IHSS 174 - Property Utilization and Disposal Container Storage Facilities

IHSS 174 consists of two separate areas incorporated within the boundaries of IHSS 170. The two separate areas have been designated as IHSS 174A and IHSS 174B, and each will be discussed separately in this section.

4.3.3.1 IHSS 174A - Drum Storage Area

Most of the SVOCs were not detected in any surface soil samples from IHSS 174A. However, a few PAHs, phthalates, and other compounds were detected: acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzoic acid, bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, pentachlorophenol, pyrene, and phenanthrene. The pesticides beta-BHC and delta-BHC were detected in three samples and one sample, respectively. Aroclor-1254 was detected in five samples. Most of the metals were detected in most or all samples. Only cesium and antimony were not detected in any sample. Cyanide was not detected in any surface-soil sample.

For the SVOCs that were detected, all except three were either detected in fewer than one-third of the samples or were estimated at levels substantially lower than the detection levels for the majority of the data for that compound. The statistical assessment was completed for the other three chemicals: bis(2-ethylhexyl) phthalate, fluoranthene, and pyrene. The pesticides and PCBs were detected in only one to four of 25 samples; consequently, none of them was carried forward through the statistical assessment. Of the metals that were detected, molybdenum, tin, mercury, selenium, silver, and thallium were detected in only one to five of the 25 samples, so they were not carried forward through the statistical assessment.

Statistical summaries of the data for the remaining chemicals are provided in Table 4-3. For $\alpha = 0.05$ and $d = 0.2$, the numbers of samples collected during Phase I, Stage 1 are sufficient for 13 of the metals. If the statistical constraints are relaxed slightly, to $\alpha = 0.1$ and $d = 0.3$, then the number of samples collected are sufficient for all the SVOCs except bis(2-ethylhexyl) phthalate and pyrene and for all the metals except beryllium, copper, nickel, lead, and vanadium. If the statistical constraints are relaxed even further, to $\alpha = 0.2$ and $d = 0.5$, the number of samples collected would be sufficient for all parameters except lead, beryllium and vanadium.

For bis(2-ethylhexyl) phthalate, the number of samples collected is sufficient for $\alpha = 0.2$ and $d = 0.5$ (Table 4-3). Thus, the number of samples is sufficient if we can accept an 80 percent confidence that the true population mean is less than twice the sample mean of 515.4 μg/kg. Because twice the sample mean is still almost two orders of magnitude less than the RBC for this compound (Section 3.1), accepting a lower confidence level of 80 percent and a larger relative error of the mean of 0.5 is not unreasonable. For pyrene, the number of samples collected is sufficient for $\alpha = 0.1$ and $d = 0.5$ (Table 4-3). Thus, the number of samples is

TABLE 4-3
Statistical Summary of Phase I, Stage 1 Surface-Soil Data for IHSS 174A

Semivolatiles (µg/kg)	Mean	Standard Deviation	η	N	n(.05, .2)	n(.1, .2)	n(.05, .3)	n(.1, .3)	n(.1, .5)	n(.2, .5)
Bis(2-ethylhexyl)phthalate	515.40	904.43	1.755	25	296	208	131	93	33	20
Fluoranthene	243.32	173.86	0.715	25	49	35	22	15	6	3
Pyrene	303.44	332.56	1.096	25	115	81	51	36	13	8
Metals (mg/kg)										
Lithium	5.20	0.85	0.163	25	3	2	1	1	0	0
Strontium	10.73	2.20	0.205	25	4	3	2	1	0	0
Aluminum	5117.69	820.71	0.160	25	2	2	1	1	0	0
Arsenic	3.03	1.16	0.381	25	14	10	6	4	2	1
Barium	62.27	11.14	0.179	25	3	2	1	1	0	0
Beryllium	2.48	7.19	2.903	25	809	570	360	253	91	55
Cadmium	0.32	0.21	0.641	25	40	28	18	12	4	3
Calcium	1610.77	382.12	0.237	25	5	4	2	2	1	0
Chromium	12.60	9.48	0.752	25	54	38	24	17	6	4
Cobalt	3.95	0.52	0.131	25	2	1	1	1	0	0
Copper	18.25	22.33	1.224	25	144	101	64	45	16	10
Iron	8546.54	877.95	0.103	25	1	1	0	0	0	0
Lead	81.58	164.95	2.022	25	393	277	175	123	44	27
Magnesium	1685.00	258.38	0.153	25	2	2	1	1	0	0
Manganese	185.46	43.16	0.233	25	5	4	2	2	1	0
Nickel	11.97	12.91	1.079	25	112	79	50	35	13	8
Potassium	1775.38	297.78	0.168	25	3	2	1	1	0	0
Sodium	118.08	39.87	0.338	25	11	8	5	3	1	1
Vanadium	2814.09	8829.24	3.138	25	945	666	420	296	107	65
Zinc	55.88	14.41	0.258	25	6	5	3	2	1	0

Notes:
η = coefficient of variation
N = number of Phase I, Stage 1 samples
n(α, d) = number of samples required for a probability α that the relative error in the estimate of the mean is ≥ d.
[shaded] = n(α, d) > N
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram

sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean of 303.4 μg/kg. Because twice the sample mean is more than three orders of magnitude less than the RBC for this compound (Section 3.1), accepting a lower confidence level of 90 percent and a larger relative error of the mean of 0.5 is not unreasonable. Thus, it can be concluded that the number of surface-soil samples collected from IHSS 174A is generally sufficient to characterize the mean values of the SVOCs within the IHSS. Similarly, for copper and nickel, the number of samples collected is sufficient for $\alpha = 0.1$ and $d = 0.5$ (Table 4-3). Thus, the number of samples is sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean of 18.25 mg/kg for copper and 11.97 mg/kg for nickel. A value of 36.5 mg/kg for copper is substantially less than the RBC of 11,000 mg/kg and only slightly greater than the background upper tolerance limit $(UTL)_{99/99}$ of 27.3 mg/kg (Section 3.1). A value of 23.94 mg/kg for nickel is also substantially less than the RBC of 5,490 mg/kg and slightly less than the background UTL of 26.9 mg/kg (Section 3.1). Thus, accepting a lower confidence level of 90 percent and a larger relative error of the mean of 0.5 is not unreasonable for either copper or nickel.

The number of samples collected is insufficient for lead, beryllium, and vanadium even for $\alpha = 0.2$ and $d = 0.5$ (Table 4-3). Thus, the distributions of these three metals in surface soils at IHSS 174A have been considered in greater detail.

The distributions of beryllium, lead, and vanadium at IHSS 174A have been investigated further by examining histograms, probability plots, and box plots, and by applying the Shapiro-Wilk test for normality (Gilbert 1987). It has been determined that the distributions of these metals appear to be neither normal nor log-normal. The underlying distributions of these metals may have some other form, or it may be that the observed data are drawn from two or more distributions (e.g., some of the data may represent background and some may result from contamination, or the data may be drawn from two background distributions with different sources).

Since the distributions of beryllium, lead, and vanadium do not appear to be either normal or log-normal, the statistical formulas used to estimate numbers of required samples may not be fully appropriate. Thus, alternate procedures have been applied for these metals. Given the small size of IHSS 174A, and its proximity to IHSS 170, the first approach was to combine the data for IHSS 174A with those for adjacent portions of IHSS 170, in essence defining alternate sampling strata for these three metals in these two IHSSs. Data from sampling points in IHSS 174A were combined with data from the eight IHSS 170 sampling locations at the northeastern end of IHSS 170 (SS004393 through SS005093). The combined data sets for beryllium, lead, and vanadium were again tested for normality using the Shapiro-Wilk test (Gilbert 1987) and were found to be distributed neither normally nor log-normally. The data sets were not considered further using statistical tests, based on the assumption of normality of the data distribution.

Geostatistical analyses were also conducted to help identify spatial structure or trends in the data. The GEO-EAS software package (Englund and Sparks 1992) was used for preliminary geostatistical assessment of the data. The assessment included plotting the data categorized by quartiles and generating semivariograms to investigate spatial correlation of the data sets. In general, the semivariograms did not help in identifying any correlation structure for the data sets. Semivariograms constructed along lines with different orientations did not reveal any significant anisotropy in the data. Furthermore, the semivariograms could not be fit reasonably by any of the standard models of the GEO-EAS software (spherical, Gaussian, exponential, or linear), largely because the semivariograms did not exhibit the typical "sill" effect (i.e., an approach to constant semivariogram value with increasing distance).

On the other hand, the graphical presentation of the data categorized by quartiles was useful in readily displaying groupings of the data. Rather than being uniformly distributed throughout the IHSS, the higher values (those in the upper 25th percentile of the data distribution) were generally grouped together. For beryllium and vanadium, the higher values were grouped together in the northeastern quadrant of the IHSS. For lead, the higher values were grouped together in a narrow band trending from the northeast to the southwest across the IHSS. Taken together, these data are consistent with an isolated "hot spot" in the northeastern quadrant of the IHSS. Following the collection of additional surface and subsurface soil samples, as recommended in Section 6.3, further geostatistical analyses of the data will be conducted.

4.3.3.2 IHSS 174B - Dumpster Storage Area

Most of the SVOCs were not detected in any surface-soil samples from IHSS 174B. However, PAHs, phthalates, and two other compounds were detected: acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzoic acid, bis(2-ethylhexyl) phthalate, chrysene, di-n-butyl phthalate, dibenzofuran, diethyl phthalate, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. No pesticides were detected; however, the PCBs Aroclor-1254 and Aroclor-1260 were detected in one sample and five samples, respectively. As expected, most of the metals were detected in most or all samples. Only cesium, molybdenum, tin, antimony, mercury, selenium, sodium, and thallium were not detected in any sample. Cyanide was not detected in any surface-soil sample.

For the SVOCs that were detected, all except six were either detected in fewer than one-third of the samples or were estimated at levels substantially lower than the detection levels for the majority of the data for that compound. The statistical assessment was completed for the other six chemicals: benzo(a)pyrene, benzo(b)fluoranthene, bis(2-ethylhexyl) phthalate, fluoranthene, phenanthrene, and pyrene. Aroclor-1254 was detected in only one of eight samples; consequently, it was not carried forward through the statistical assessment. Of the metals that were detected, copper was detected in only one of the eight samples, so it was not carried forward through the statistical assessment.

Statistical summaries of the data for the remaining chemicals are provided in Table 4-4. For $\alpha = 0.05$ and $d = 0.2$, the numbers of samples collected during Phase I, Stage 1 are sufficient for six of the metals. If the statistical constraints are relaxed slightly, to $\alpha = 0.1$ and $d = 0.3$, then the number of samples collected is sufficient or nearly sufficient for two of the SVOCs and for all of the metals except magnesium and zinc.

The number of samples collected is sufficient for bis(2-ethylhexyl) phthalate, fluoranthene, phenanthrene, and pyrene for $\alpha = 0.1$ and $d = 0.5$ (Table 4-4). Thus, the number of samples is sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean for these compounds. For bis(2-ethylhexyl) phthalate, twice the sample mean of 91.88 μg/kg, or 183.76 μg/kg, is several orders of magnitude less than the RBC of 45,700 μg/kg (Section 3.1). For fluoranthene, twice the sample mean of 397.5 μg/kg, or 795 μg/kg, is several orders of magnitude less than the RBC of 1.1×10^7 μg/kg (Section 3.1). For pyrene, twice the sample mean of 357.5 μg/kg, or 715 μg/kg, is several orders of magnitude less than the RBC of 8.23×10^6 μg/kg (Section 3.1). For phenanthrene, there is no RBC, so twice the sample mean cannot be compared against the RBC. Therefore, we have no basis for concluding that relaxing the statistical parameters for phenanthrene is reasonable. However, given the similarities in statistical properties among phenanthrene, fluoranthene, and pyrene (Table 4-4), and the fact that phenanthrene is a noncarcinogenic PAH like fluoranthene and pyrene, it is probable that sufficient data have been collected to characterize the mean distribution of phenanthrene for $\alpha = 0.1$ and $d = 0.5$. Thus, accepting a lower confidence level of 90 percent and a larger relative error of the mean of 0.5 is not unreasonable. It can be concluded that the number of surface soil samples collected from IHSS 174B is sufficient to reasonably characterize the mean values of the SVOCs with the possible exception of phenanthrene within the IHSS.

For magnesium and zinc, the number of samples collected is sufficient for $\alpha = 0.1$ and $d = 0.5$ (Table 4-4). Thus, the number of samples is sufficient if we can accept a 90 percent confidence

TABLE 4-4
Statistical Summary of Phase I, Stage 1 Surface-Soil Data for IHSS 174B

Semivolatiles (µg/kg)	Mean	Standard Deviation	η	N	n(.05, .2)	n(.1, .2)	n(.05, .3)	n(.1, .3)	n(.1, .5)	n(.2, .5)
Benzo(a)pyrene	140.00	69.08	0.493	8	23	16	10	7	3	2
Benzo(b)fluoranthene	233.50	111.97	0.480	8	22	16	10	7	2	2
Bis(2-ethylhexyl)phthalate	91.88	70.26	0.765	8	56	40	25	18	6	4
Fluoranthene	397.50	241.17	0.607	8	35	25	16	11	4	2
Phenanthrene	293.50	207.28	0.706	8	48	34	21	15	5	3
Pyrene	357.50	209.81	0.587	8	33	23	15	10	4	2
Pesticides/PCBs (µg/kg)										
Aroclor-1260	301.88	243.21	0.806	8	62	44	28	20	7	4
Metals (mg/kg)										
Lithium	7.23	2.31	0.320	8	10	7	4	3	1	1
Strontium	12.70	3.39	0.267	8	7	5	3	2	0	1
Aluminum	7098.75	2128.05	0.300	8	9	6	4	3	1	1
Arsenic	4.09	1.24	0.303	8	9	6	4	3	1	1
Barium	81.85	16.94	0.207	8	4	3	2	1	0	0
Beryllium	0.36	0.10	0.283	8	8	5	3	2	1	1
Cadmium	0.53	0.20	0.368	8	13	9	6	4	1	1
Calcium	2303.75	1143.60	0.496	8	24	17	11	7	3	2
Chromium	12.10	3.39	0.280	8	8	5	3	2	1	1
Cobalt	5.18	1.73	0.335	8	11	8	5	3	1	1
Iron	12480.00	4440.49	0.356	8	12	9	5	4	1	1
Lead	25.85	6.06	0.234	8	5	4	2	2	1	0
Magnesium	2386.25	1316.27	0.552	8	29	21	13	9	3	2
Manganese	258.63	111.17	0.430	8	18	12	8	6	2	1
Nickel	4.57	2.38	0.521	8	26	18	12	8	3	2
Potassium	2150.00	630.40	0.293	8	8	6	4	3	1	1
Silver	1.14	0.37	0.327	8	10	7	5	3	1	1
Vanadium	20.49	7.47	0.364	8	13	9	6	4	1	1
Zinc	110.03	78.29	0.712	8	49	34	22	15	5	3

Notes:
η = coefficient of variation
N = number of Phase I, Stage 1 samples
n(α, d) = number of samples required for a probability α that the relative error in the estimate of the mean is ≥ d.
[shaded] = n(α, d) > N
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram

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that the true population mean is less than twice the sample mean of 2,386 mg/kg for magnesium, and 110 mg/kg for zinc. A value of 220 mg/kg for zinc is substantially less than the RBC of 82,300 mg/kg, although it exceeds the background $UTL_{99/99}$ of 86.6 mg/kg (Section 3.1). Thus, accepting a lower confidence level of 90 percent and a larger relative error of the mean of 0.5 is not unreasonable for comparing the zinc distribution to the RBC, although zinc concentrations within IHSS 174B do exceed the background $UTL_{99/99}$. For magnesium, there is no RBC, so we cannot compare twice the sample mean to the RBC. However, twice the sample mean (4,772 mg/kg) is less than the background $UTL_{99/99}$ (7,012 mg/kg) and the magnesium distribution is similar to those for calcium and iron, so it is probable that sufficient data have been collected to characterize the mean distribution of magnesium for $\alpha = 0.1$ and $d = 0.5$.

For Aroclor-1260, the number of samples collected is sufficient for $\alpha = 0.1$ and $d = 0.5$ (Table 4-4). Thus, the number of samples is sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean. However, for Aroclor-1260, the sample mean of 301.88 μg/kg is greater than the RBC of 83.2 μg/kg (Section 3.1). Thus, the distribution of Aroclor-1260 in surface soils at IHSS 174B will have to be considered in greater detail.

The distribution of PCB-1260 at IHSS 174B has been investigated further by examining histograms, probability plots, and box plots, and by applying the Shapiro-Wilk test for normality (Gilbert 1987). It has been determined that the distribution of PCB-1260 appears to be neither normal nor log-normal. The underlying distributions of this compound may have some other form, or it may be that the observed data are drawn from two or more distributions.

Since the distribution of PCB-1260 does not appear to be either normal or log-normal, the statistical formulas used to estimate numbers of required samples may not be fully appropriate. Thus, alternate procedures have been applied for this compound. Given the small size of IHSS

174B, and its proximity to IHSS 170, the first approach was to combine the data for IHSS 174B with those for adjacent portions of IHSS 170, in essence defining alternate sampling strata for PCB-1260 in these two IHSSs. Data from sampling points in IHSS 174B were combined with data from the eight nearest IHSS 170 sampling locations (SS006493 through SS006693, SS006893 through SS007193, and SS007493). Since all of these samples from IHSS 170 were nondetections for PCB-1260, the data sets were not considered further using statistical tests based on the assumption of normality of the data distribution.

Geostatistical analyses were also conducted to help identify spatial structure or trends in the data. The GEO-EAS software package (Englund and Sparks 1992) was used for preliminary geostatistical assessment of the data. The assessment included plotting the data categorized by quartiles and generating semivariograms to investigate spatial correlation of the data sets. In general, the semivariograms did not help in identifying any correlation structure for the data sets. Semivariograms constructed along lines with different orientations did not reveal any significant anisotropy in the data. Furthermore, the semivariograms could not be fit reasonably by any of the standard models of the GEO-EAS software (spherical, Gaussian, exponential, or linear), largely because the semivariograms did not exhibit the typical "sill" effect (i.e., an approach to constant semivariogram value with increasing distance).

On the other hand, the graphical presentation of the data categorized by quartiles was useful in readily displaying groupings of the data. Rather than being uniformly distributed throughout the IHSS, the higher values (those in the upper 25th percentile of the data distribution) were generally grouped together along a line from west to east through the IHSS. The trend of the elevated data did not appear to extend beyond IHSS 174B into IHSS 170. These data are consistent with an isolated "hot spot" in the central portion of the IHSS. Following the collection of additional surface- and subsurface-soil samples, as recommended in Section 6.4, further geostatistical analyses of the data will be conducted.

4.3.4 IHSS 175 - Swingerton and Walberg Building 980 Container Storage Facility

Most of the SVOCs were not detected in any surface soil samples from IHSS 175. However, a few PAHs and phthalates were detected: 2-methylnaphthalene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzoic acid, bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, chrysene, di-n-butyl phthalate, dimethyl phthalate, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. No pesticides or PCBs were detected. Most of the metals were detected in most or all samples. Only cesium, molybdenum, tin, antimony, selenium, sodium, and thallium were not detected in any sample. Cyanide was not detected in any surface-soil sample.

For the SVOCs that were detected, all except eight were either detected in fewer than one-third of the samples or were at estimated levels substantially lower than the detection levels for the majority of the data for that compound. The statistical assessment was completed for the other eight chemicals: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene. Of the metals that were detected, mercury was detected in only one of the 10 samples, so it was not carried forward through the statistical assessment.

Statistical summaries of the data for the remaining chemicals are provided in Table 4-5. For $\alpha = 0.05$ and $d = 0.2$, the numbers of samples collected during Phase I, Stage 1 are sufficient for eight of the metals. However, if the statistical constraints are relaxed slightly, to $\alpha = 0.1$ and $d = 0.3$, then the number of samples collected is sufficient for three of the semivolatiles, benzo(a)anthracene, benzo(a)pyrene, and benzo(k)fluoranthene, and all the metals except for cadmium, calcium and silver.

TABLE 4-5
Statistical Summary of Phase I, Stage 1 Surface-Soil Data for IHSS 175

Semivolatiles (µg/kg)	Mean	Standard Deviation	η	N	n(.05, .2)	n(.1, .2)	n(.05, .3)	n(.1, .3)	n(.1, .5)	n(.2, .5)
Benzo(a)anthracene	207.20	96.21	0.464	10	21	15	9	6	2	1
Benzo(a)pyrene	233.50	113.80	0.487	10	23	16	10	7	3	2
Benzo(b)fluoranthene	300.00	212.15	0.707	10	48	34	21	15	5	3
Benzo(k)fluoranthene	151.70	72.48	0.478	10	22	15	10	7	2	1
Chrysene	202.60	140.27	0.692	10	46	32	20	14	5	3
Fluoranthene	426.20	354.95	0.833	10	67	47	30	21	8	5
Phenanthrene	230.20	160.83	0.699	10	47	33	21	15	5	3
Pyrene	375.50	284.05	0.756	10	55	39	24	17	6	4
Metals (mg/kg)										
Lithium	6.61	1.17	0.177	10	3	2	1	1	0	0
Strontium	24.20	12.65	0.523	10	26	18	12	8	3	2
Aluminum	7059.00	1401.99	0.199	10	4	3	2	1	0	0
Arsenic	3.58	1.42	0.397	10	15	11	7	5	2	1
Barium	71.76	25.06	0.349	10	12	8	5	4	1	1
Beryllium	0.42	0.16	0.382	10	14	10	6	4	2	1
Cadmium	0.40	0.27	0.678	10	44	31	20	14	5	3
Calcium	16146.00	15890.57	0.984	10	93	66	41	29	10	6
Chromium	23.26	9.71	0.417	10	17	12	7	5	2	1
Cobalt	4.82	1.22	0.253	10	6	4	3	2	1	0
Copper	26.89	12.85	0.478	10	22	15	10	7	2	1
Iron	12760.00	1640.60	0.129	10	2	1	1	0	0	0
Lead	20.80	8.03	0.386	10	14	10	6	4	2	1
Magnesium	2029.00	283.14	0.140	10	2	1	1	1	0	0
Manganese	175.10	60.78	0.347	10	12	8	5	4	1	1
Nickel	18.08	6.98	0.386	10	14	10	6	4	2	1
Potassium	1862.00	243.76	0.131	10	2	1	1	1	0	0
Silver	0.49	0.34	0.697	10	47	33	21	15	5	3
Vanadium	19.87	3.01	0.151	10	2	2	1	1	0	0
Zinc	70.74	23.36	0.330	10	10	7	5	3	1	1

Notes:

η = coefficient of variation
N = number of Phase I samples
n(α, d) = number of samples required for a probability α that the relative error in the estimate of the mean is ≥ d.
[shaded] = n(α, d) > N
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

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The number of samples collected is sufficient for benzo(b)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene for $\alpha = 0.1$ and $d = 0.5$ (Table 4-5). Thus, the number of samples is sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean for these compounds. For benzo(b)fluoranthene, twice the sample mean of 300 μg/kg, or 600 μg/kg, is slightly less than the RBC of 877 μg/kg (Section 3.1). For chrysene, twice the sample mean of 202.6 μg/kg, or 405.2 μg/kg, is several orders of magnitude less than the RBC of 87700 μg/kg (Section 3.1). For fluoranthene, twice the sample mean of 426.2 μg/kg, or 852.4 μg/kg, is several orders of magnitude less than the RBC of 1.1×10^7 μg/kg (Section 3.1). For pyrene, twice the sample mean of 375.5 μg/kg, or 751.4 μg/kg, is several orders of magnitude less than the RBC of 8.23×10^6 μg/kg (Section 3.1). For phenanthrene, there is no RBC, so twice the sample mean cannot be compared against the RBC. Therefore, we have no basis for concluding that relaxing the statistical parameters for phenanthrene is reasonable. However, given the similarities in statistical properties among phenanthrene, fluoranthene, and pyrene (Table 4-5), and the fact that phenanthrene is a noncarcinogenic PAH like fluoranthene and pyrene, it is probable that sufficient data have been collected to characterize the mean distribution of phenanthrene for $\alpha = 0.1$ and $d = 0.5$. Thus, accepting a lower confidence level of 90 percent and a larger relative error of the mean of 0.5 is not unreasonable, and it can be concluded that the number of surface soil samples collected from IHSS 175 is sufficient to reasonably characterize the mean values of the SVOCs, with the possible exception of phenanthrene, within the IHSS.

For cadmium, calcium and silver, the number of samples collected is sufficient for $\alpha = 0.1$ and $d = 0.5$ (Table 4-5). Thus, the number of samples is sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean for these compounds. For cadmium, twice the sample mean of 0.40 mg/kg, or 0.80 mg/kg, is substantially less than the RBC of 137 mg/kg or the background $UTL_{99/99}$ of 5 mg/kg. For silver, twice the sample mean of 0.49 mg/kg, or 0.98 mg/kg, is substantially less than either the RBC of 1370 mg/kg or the background $UTL_{99/99}$ of 10 mg/kg. Thus, accepting a lower confidence level of 90 percent and a larger relative error of the mean of 0.5 is not unreasonable for cadmium or silver at IHSS 175. For calcium, there is no RBC, so we cannot compare twice the sample mean to the RBC. The sample mean (16,146 mg/kg) exceeds the background $UTL_{99/99}$ (13,573 mg/kg), so calcium may be elevated in surface soils at IHSS 175. However, the coefficient of variation of the calcium distribution is similar to that for fluoranthene, phenanthrene, and pyrene (Table 4-5), so it is probable that sufficient data have been collected to characterize the mean distribution of calcium for $\alpha = 0.1$ and $d = 0.5$.

4.3.5 IHSS 176 - Swingerton and Walberg Contractor Storage Yard

Most of the SVOCs were not detected in any surface soil samples from IHSS 176. However, several PAHs, phthalates, and other compounds were detected: 2-methylnaphthalene, 4-chloro-3-methylphenol, 4-methylphenol, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzoic acid, bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, chrysene, di-n-butyl phthalate, di-n-octyl phthalate, dibenzo(a,h)anthracene, dibenzofuran, dimethyl phthalate, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, pentachlorophenol, phenanthrene, and pyrene. No pesticides were detected, although Aroclor-1254 and Aroclor-1260 were detected. Most of the metals were detected in most or all samples. Only antimony and thallium were not detected in any samples. Cyanide was not detected in any surface soil sample.

For the SVOCs that were detected, all except nine were either detected in fewer than one-third of the samples, or were estimated at levels substantially lower than the detection levels for the majority of the data for that compound. The statistical assessment was completed for the other nine chemicals: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Of the metals that were detected, molybdenum, tin, selenium, and silver were detected in only one to seven of the 28 samples and so they were not carried forward through the statistical assessment. Sodium was detected in 12 samples, but was estimated at levels substantially lower than the detection levels for much of the data. Therefore, sodium was also not carried forward through the statistical assessment.

Statistical summaries of the data for the remaining chemicals are provided in Table 4-6. For $\alpha = 0.05$ and $d = 0.2$, the numbers of samples collected during Phase I, Stage 1 are sufficient for 12 of the metals. However, if the statistical constraints are relaxed slightly, to $\alpha = 0.1$ and $d = 0.3$, then the number of samples collected are sufficient for two of the SVOCs, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene, and all the metals except cesium and arsenic.

The number of samples collected is sufficient for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and chrysene for $\alpha = 0.1$ and $d = 0.5$, and for fluoranthene, phenanthrene and pyrene for $\alpha = 0.2$ and $d = 0.5$ (Table 4-6). Thus, the number of samples is sufficient if we can accept an 80 percent confidence that the true population mean is less than twice the sample mean for fluoranthene, phenanthrene, and pyrene, and a 90 percent confidence level that the true population mean is less than twice the sample mean for the other three compounds. Twice the sample mean is less than the RBC (Section 3.1) for all of these compounds except benzo(a)pyrene and phenanthrene. For benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene, twice the sample mean is several orders of magnitude less than the RBC. For phenanthrene, there is no RBC, so twice the sample mean cannot be compared against the RBC. Therefore, we have no basis for concluding that relaxing the statistical parameters for phenanthrene is reasonable. However, given the similarities in statistical properties among phenanthrene, fluoranthene, and pyrene (Table 4-6), and the fact that phenanthrene is a noncarcinogenic PAH like fluoranthene and pyrene, it is probable that sufficient data have been collected to characterize the mean distribution of phenanthrene for $\alpha = 0.2$ and $d = 0.5$. For benzo(a)pyrene, the sample mean of 226.9 μg/kg exceeds the RBC of 87.7 μg/kg. Thus, the distribution of benzo(a)pyrene in surface soils at IHSS 176 is considered in greater detail.

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TABLE 4-6
Statistical Summary of Phase I, Stage 1 Surface-Soil Data for IHSS 176

Semivolatiles (µg/kg)	Mean	Standard Deviation	η	N	n(.05, .2)	n(.1, .2)	n(.05, .3)	n(.1, .3)	n(.1, .5)	n(.2, .5)
Benzo(a)anthracene	238.61	327.67	1.373	28	181	128	80	57	20	12
Benzo(a)pyrene	226.86	318.10	1.402	28	189	133	84	59	21	13
Benzo(b)fluoranthene	284.89	459.71	1.614	28	250	176	111	78	28	17
Benzo(k)fluoranthene	196.54	129.21	0.657	28	42	29	18	13	5	3
Chrysene	231.96	334.99	1.444	28	200	141	89	63	23	14
Fluoranthene	426.14	879.32	2.063	28	409	288	182	128	46	28
Indeno(1,2,3-cd)pyrene	189.68	170.29	0.898	28	77	55	34	24	9	5
Phenanthrene	332.46	624.25	1.878	28	339	239	150	106	38	23
Pyrene	403.64	691.69	1.714	28	282	199	125	88	32	19
Metals (mg/kg)										
Cesium	6.08	4.78	0.786	16	59	42	26	19	7	4
Lithium	9.35	3.10	0.331	28	11	7	5	3	1	1
Strontium	20.39	13.84	0.679	28	44	31	20	14	5	3
Aluminum	8787.86	4538.79	0.516	28	26	18	11	8	3	2
Arsenic	7.43	7.64	1.028	28	102	72	45	32	11	7
Barium	81.29	27.65	0.340	28	11	8	5	3	1	1
Beryllium	0.70	0.46	0.651	28	41	29	18	13	5	3
Cadmium	4.08	3.95	0.969	28	90	64	40	28	10	6
Calcium	6035.00	5298.11	0.878	28	74	52	33	23	8	5
Chromium	16.39	5.50	0.336	28	11	8	5	3	1	1
Cobalt	5.37	2.61	0.486	28	23	16	10	7	3	2
Copper	16.04	6.06	0.378	28	14	10	6	4	2	1
Iron	11995.71	3121.64	0.260	28	7	5	3	2	1	0
Lead	26.84	24.48	0.912	28	80	56	36	25	9	5
Magnesium	2161.75	511.11	0.236	28	5	4	2	2	1	0
Manganese	196.20	71.71	0.365	28	13	9	6	4	1	1
Mercury	0.0677	0.0643	0.949	28	86	61	38	27	10	6
Nickel	8.79	4.34	0.493	28	23	16	10	7	3	2
Potassium	2162.04	567.01	0.262	28	7	5	3	2	1	0
Vanadium	23.34	8.94	0.383	28	14	10	6	4	2	1
Zinc	84.48	71.35	0.845	28	68	48	30	21	8	5

Notes:

η = coefficient of variation
N = number of Phase I, Stage 1 samples
n(α, d) = number of samples required for a probability α that the relative error in the estimate of the mean is ≥ d.
[shaded] = n(α, d) > N
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

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The number of samples collected is sufficient for cesium and arsenic for $\alpha = 0.1$ and $d = 0.5$. Thus, the number of samples is sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean. For arsenic, twice the sample mean of 7.4 mg/kg, or 14.8 mg/kg, is greater than both the RBC (0.37 mg/kg) and the background $UTL_{99/99}$ (12.9 mg/kg). Thus the arsenic distribution at IHSS 176 will have to be considered further. For cesium, twice the sample mean of 6.1 mg/kg, or 12.2 mg/kg, is substantially less than the background UTL (631 mg/kg), but there is no RBC for cesium. Since the coefficient of variation of the cesium distribution is similar to those for strontium, beryllium, cadmium, and lead, it is probable that sufficient samples have been collected for cesium. However, this cannot be confirmed because no comparison of twice the sample mean can be made with an RBC.

The distributions of benzo(a)pyrene and arsenic at IHSS 176 have been investigated further by examining histograms, probability plots, and box plots, and by applying the Shapiro-Wilk test for normality (Gilbert 1987). It has been determined that the distributions of benzo(a)pyrene and arsenic appear to be neither normal nor log-normal. The distributions do appear to be much more nearly log-normal than normal, but the Shapiro-Wilk test does not allow the rejection of the null hypothesis of normality of the distributions of log-transformed values of benzo(a)pyrene or arsenic concentrations.

Since the distributions of benzo(a)pyrene and arsenic do not appear to be either normal or log-normal, the statistical formulas used to estimate numbers of required samples may not be fully appropriate. Thus, alternate procedures have been applied for these constituents.

Geostatistical analyses were conducted to help identify spatial structure or trends in the data. The GEO-EAS software package (Englund and Sparks 1992) was used for preliminary geostatistical assessment of the data. The assessment included plotting the data categorized by quartiles and generating semivariograms to investigate spatial correlation of the data sets. In general, the semivariograms did not help in identifying any correlation structure for the benzo(a)pyrene data, although some structure could be seen in the arsenic data. Semivariograms constructed along lines with different orientations did not reveal any significant anisotropy in the benzo(a)pyrene data, although some evidence of anisotropy could be seen in the arsenic data. Furthermore, the benzo(a)pyrene semivariograms could not be fit reasonably by any of the standard models of the GEO-EAS software (spherical, Gaussian, exponential, or linear), largely because the semivariograms did not exhibit the typical "sill" effect (i.e., an approach to constant semivariogram value with increasing distance). However, the semivariogram for arsenic data, oriented in a southwest-northeast direction, could be fit reasonably well by a Gaussian model. This suggests that further geostatistical analyses, such as kriging the arsenic concentration data, might be useful at IHSS 176.

The graphical presentation of the data categorized by quartiles was useful in readily displaying groupings of the data for both benzo(a)pyrene and arsenic. In general, the quartiles for the benzo(a)pyrene data were uniformly distributed throughout the IHSS, suggesting the lack of any real trends. Thus, it may be that the data are randomly distributed but drawn from a log-normal or some other underlying distribution. The plotting of arsenic data categorized by quartiles indicated that a "hot spot" appears to be present in the southwest quadrant of the IHSS. Following the collection of additional surface and subsurface soil samples, as recommended in Section 6.6, further statistical and geostatistical analyses of the data will be conducted.

4.3.6 IHSS 177 - Building 885 Drum Storage Area

Most of the SVOCs were not detected in any surface-soil samples from IHSS 177. However, a few PAHs and phthalates were detected: 2-methylnaphthalene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, benzoic acid, bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, chrysene, di-n-butyl phthalate, dibenzofuran, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene. Most of the metals were detected in most or all samples. Only tin, antimony, cadmium, and thallium were not detected in any sample.

For the semivolatile compounds that were detected, all but five were either detected in fewer than one-third of the samples, or were estimated at levels substantially lower than the detection levels for the majority of the data for that compound. The statistical assessment was completed for the other three chemicals: bis(2-ethylhexyl) phthalate, phenanthrene, and pyrene. Of the metals that were detected, cesium, molybdenum, and mercury were detected in only one to four of the 10 samples; therefore, they were not carried forward through the statistical assessment.

Statistical summaries of the data for the remaining chemicals are provided in Table 4-7. For $\alpha = 0.05$ and $d = 0.2$, the numbers of samples collected during Phase I, Stage 1 are sufficient for 10 of the metals. However, if the statistical constraints are relaxed slightly, to $\alpha = 0.1$ and $d = 0.3$, then the numbers of samples collected are sufficient for all the metals except for calcium, chromium, lead, and zinc.

The number of samples collected is sufficient for bis(2-ethylhexyl) phthalate for $\alpha = 0.1$ and $d = 0.5$ (Table 4-7). Thus, the number of samples is sufficient for this compound if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean. Twice the sample mean of 160.9 μg/kg, or 321.8 μg/kg, is several orders of magnitude less than the RBC of 45,700 μg/kg (Section 3.1). Therefore, we can reasonably conclude that the number of samples collected is sufficient to characterize the mean value of bis(2-ethylhexyl) phthalate at IHSS 177. However, even for $\alpha = 0.2$ and $d = 0.5$, the number of samples collected is not sufficient for phenanthrene and pyrene. Thus, the distributions of these compounds will be considered in greater detail below.

For calcium and chromium, the number of samples collected is sufficient for $\alpha = 0.1$ and $d = 0.5$, and for lead and zinc the number of samples collected is sufficient for $\alpha = 0.2$ and

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TABLE 4-7
Statistical Summary of Phase I, Stage 1
Surface-Soil Data for IHSS 177

Semivolatiles (µg/kg)	Mean	Standard Deviation	η	N	n(.05, .2)	n(.1, .2)	n(.05, .3)	n(.1, .3)	n(.1, .5)	n(.2, .5)
Bis(2-ethylhexyl)phthalate	160.90	113.28	0.704	10	48	34	21	15	5	3
Phenanthrene	378.80	658.98	1.740	10	291	205	129	91	33	20
Pyrene	516.00	938.51	1.819	10	318	224	141	99	36	22
Metals (mg/kg)										
Lithium	6.66	1.35	0.203	10	4	3	2	1	0	0
Strontium	88.27	43.57	0.494	10	23	16	10	7	3	2
Aluminum	8901.00	1363.26	0.153	10	2	2	1	1	0	0
Arsenic	4.95	1.82	0.368	10	13	9	6	4	1	1
Barium	195.07	109.51	0.561	10	30	21	13	9	3	2
Beryllium	0.58	0.18	0.303	10	9	6	4	3	1	1
Calcium	29551.00	25951.16	0.878	10	74	52	33	23	8	5
Chromium	13.04	10.65	0.817	10	64	45	28	20	7	4
Cobalt	7.07	1.97	0.278	10	7	5	3	2	1	1
Copper	20.14	6.84	0.340	10	11	8	5	3	1	1
Iron	12059.00	2185.80	0.181	10	3	2	1	1	0	0
Lead	25.77	27.55	1.069	10	110	77	49	34	12	8
Magnesium	3300.00	890.24	0.270	10	7	5	3	2	1	0
Manganese	225.60	57.11	0.253	10	6	4	3	2	1	0
Nickel	11.66	3.67	0.314	10	9	7	4	3	1	1
Potassium	1210.00	377.83	0.312	10	9	7	4	3	1	1
Selenium	0.58	0.25	0.437	9	18	13	8	6	2	1
Silver	1.11	0.58	0.523	10	26	19	12	8	3	2
Sodium	249.59	143.73	0.576	10	32	22	14	10	4	2
Vanadium	26.08	3.98	0.153	10	2	2	1	1	0	0
Zinc	109.70	130.13	1.186	10	135	95	60	42	15	9

Notes:

η = coefficient of variation
N = number of Phase I, Stage 1 samples
n(α, d) = number of samples required for a probability α that the relative error in the estimate of the mean is ≥ d.
[shaded] = n(α, d) > N
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

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d = 0.5 (Table 4-7). Thus, the number of samples is sufficient if we can accept a 90 percent confidence for calcium and chromium, an 80 percent confidence for lead and zinc, that the population mean is less than twice the sample mean. For chromium, twice the sample mean of 13.0 mg/kg, or 26.0 mg/kg, is substantially less than the RBC of 962 mg/kg, and only slightly greater than the background $UTL_{99/99}$ of 24.8 mg/kg. For zinc, twice the sample mean of 109.7 mg/kg, or 219.4 mg/kg, exceeds the UTL of 86.6 mg/kg, but is several orders of magnitude less than the RBC of 82,300 mg/kg. RBCs and background UTLs for these metals are discussed in Section 3.1. Based on these results, we can reasonably conclude that accepting lower confidence and greater relative error in the mean is not unreasonable for these metals.

For calcium and lead, there are no RBCs, so we cannot compare twice the sample means to the RBCs. For calcium, the sample mean of 29,551 mg/kg is greater than the background $UTL_{99/99}$ of 13,573 mg/kg, so calcium may be elevated in surface soils at IHSS 177. However, the coefficient of variation of the calcium distribution is similar to those for chromium and zinc (Table 4-7), so it is probable that sufficient data have been collected to characterize the mean distribution of calcium for $\alpha = 0.1$ and $d = 0.5$. For lead, twice the sample mean of 25.8 mg/kg, or 51.6 mg/kg, is less than the background UTL. Furthermore, the coefficient of variation of the lead distribution is similar to those for calcium, chromium, and zinc (Table 4-7), so it is probable that sufficient data have been collected to characterize the mean distribution of lead for $\alpha = 0.1$ and $d = 0.5$.

The distributions of phenanthrene and pyrene at IHSS 177 have been investigated further by examining histograms, probability plots, and box plots, and by applying the Shapiro-Wilk test for normality (Gilbert 1987). It has been determined that the distributions of phenanthrene and pyrene appear to be log-normal. The Shapiro-Wilk test requires the rejection of the null hypothesis of normality of the distribution of log-transformed values of concentrations of these two compounds. Furthermore, the assessment of the numbers of physical samples required (Section 4.2), when applied to the logarithms of the concentrations of phenanthrene and pyrene, indicated that sufficient samples have been collected for these compounds. However, any further assessment of the distributions of these parameters should be based on the assumption that their concentrations are distributed log-normally within IHSS 177.

4.3.7 IHSS 181 - Building 334 Cargo Container Area

No surface-soil samples were collected at IHSS 181.

4.3.8 IHSS 182 - Building 444/453 Drum Storage Area

No surface-soil samples were collected at IHSS 182.

4.3.9 IHSS 205 - Building 460 Sump #3 Acid Side

No surface-soil samples were collected at IHSS 205.

4.3.10 IHSS 206 - Inactive D-836 Hazardous Waste Tank

Metals are the only potential contaminants analyzed for in surface soil samples from IHSS 206. Most of the metals were detected in most or all samples. Only tin, selenium, and thallium were not detected in any sample.

Of the metals that were detected, antimony, cadmium, and mercury were detected in only one or two of the 10 samples and so they were not carried forward through the statistical assessment.

Statistical summaries of the data for the remaining inorganics are provided in Table 4-8. For $\alpha = 0.05$ and $d = 0.2$, the numbers of samples collected during Phase I, Stage 1 are sufficient for all the metals except copper, sodium, and zinc. However, if the statistical constraints are

TABLE 4-8
Statistical Summary of Phase I, Stage 1 Surface-Soil Data for IHSS 206

Metals (mg/kg)	Mean	Standard Deviation	η	N	n(.05, .2)	n(.1, .2)	n(.05, .3)	n(.1, .3)	n(.1, .5)	n(.2, .5)
Cesium	4.59	0.98	0.214	10	4	3	2	1	0	0
Lithium	5.58	0.39	0.070	10	0	0	0	0	0	0
Molybdenum	3.70	0.42	0.115	10	1	1	1	0	0	0
Strontium	19.32	3.21	0.166	10	3	2	1	1	0	0
Aluminum	5690.00	960.25	0.169	10	3	2	1	1	0	0
Arsenic	4.10	1.13	0.276	10	7	5	3	2	1	1
Barium	55.03	8.37	0.152	10	2	2	1	1	0	0
Beryllium	0.37	0.10	0.268	10	7	5	3	2	1	0
Calcium	3710.00	1080.08	0.291	10	8	6	4	3	1	1
Chromium	10.60	1.25	0.118	10	1	1	1	0	0	0
Cobalt	4.75	0.54	0.113	10	1	1	1	0	0	0
Copper	18.82	7.25	0.385	10	14	10	6	4	2	1
Iron	12030.00	1381.67	0.115	10	1	1	1	0	0	0
Lead	10.27	2.42	0.236	10	5	4	2	2	1	0
Magnesium	2349.00	518.90	0.221	10	5	3	2	1	1	0
Manganese	211.10	49.14	0.233	10	5	4	2	2	1	0
Nickel	8.52	2.09	0.246	10	6	4	3	2	1	0
Potassium	1413.00	328.74	0.233	10	5	4	2	2	1	0
Silver	1.34	0.14	0.107	10	1	1	0	0	0	0
Sodium	230.30	85.61	0.372	10	13	9	6	4	1	1
Vanadium	19.05	2.24	0.118	10	1	1	1	0	0	0
Zinc	85.55	64.34	0.752	10	54	38	24	17	6	4

Notes:
η = coefficient of variation
N = number of Phase I, Stage 1 samples
n(α, d) = number of samples required for a probability α that the relative error in the estimate of the mean is ≥ d.
[shaded] = n(α, d) > N
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

relaxed very slightly, to $\alpha = 0.1$ and $d = 0.2$, then the number of samples collected are sufficient for all the metals except for zinc.

The number of samples collected is sufficient for zinc for $\alpha = 0.1$ and $d = 0.5$ (Table 4-8). Thus, the number of samples is sufficient for zinc if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean. Twice the sample mean of 85.55 mg/kg, or 171.1 mg/kg, is several orders of magnitude less than the RBC of 82,300 mg/kg (Section 3.1), although about twice the background $UTL_{99/99}$. Therefore, we can reasonably conclude that the number of samples collected is sufficient to characterize the mean value of zinc at IHSS 206.

4.3.11 IHSS 207 - Inactive Building 444 Acid Dumpster

No surface-soil samples were collected at IHSS 207.

4.3.12 IHSS 208 - Inactive 444/447 Waste Storage Area

Metals are the only potential contaminants analyzed for in surface-soil samples from IHSS 208. Only three surface-soil samples were collected. Most of the metals were detected in most or all samples. Only cesium, tin, antimony, cadmium, and thallium were not detected in any sample. Of the metals that were detected, molybdenum was detected in only one of the three samples and so was not carried forward through the statistical assessment.

Statistical summaries of the data for the remaining inorganics are provided in Table 4-9. For $\alpha = 0.05$ and $d = 0.2$, the numbers of samples collected during Phase I, Stage 1 are sufficient for six of the constituents. However, if the statistical constraints are relaxed slightly, to $\alpha = 0.1$ and $d = 0.3$, then the number of samples collected are sufficient for 11 of the metals.

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TABLE 4-9
Statistical Summary of Phase I, Stage 1
Surface-Soil Data for IHSS 208

Metals (mg/kg)	Mean	Standard Deviation	η	N	n(.05, .2)	n(.1, .2)	n(.05, .3)	n(.1, .3)	n(.1, .5)	n(.2, .5)
Lithium	5.83	1.10	0.189	3	3	2	2	1	0	0
Strontium	16.27	1.32	0.081	3	1	0	0	0	0	0
Aluminum	8146.67	3982.87	0.489	3	23	16	10	7	3	2
Arsenic	5.53	2.67	0.483	3	22	16	10	7	3	2
Barium	61.53	11.82	0.192	3	4	2	2	1	0	0
Beryllium	0.82	0.36	0.441	3	19	13	8	6	2	1
Calcium	3156.67	299.39	0.095	3	1	1	0	0	0	0
Chromium	14.20	0.87	0.061	3	0	0	0	0	0	0
Cobalt	7.90	4.16	0.526	3	27	19	12	8	3	2
Copper	25.33	11.97	0.473	3	21	15	10	7	2	1
Iron	12666.67	3156.47	0.249	3	6	4	3	2	1	0
Lead	26.17	10.99	0.420	3	17	12	8	5	2	1
Magnesium	2136.67	423.95	0.198	3	4	3	2	1	0	0
Manganese	205.00	28.05	0.137	3	2	1	1	1	0	0
Mercury	0.08	0.03	0.362	3	13	9	6	4	1	1
Nickel	15.03	3.32	0.221	3	5	3	2	1	1	0
Potassium	1226.67	142.24	0.116	3	1	1	1	0	0	0
Selenium	0.60	0.30	0.498	3	24	17	11	7	3	2
Silver	1.58	0.68	0.433	3	18	13	8	6	2	1
Sodium	166.07	67.50	0.406	3	16	11	7	5	2	1
Vanadium	32.93	8.72	0.265	3	7	5	3	2	1	0
Zinc	164.33	59.91	0.365	3	13	9	6	4	1	1

Notes:

η = coefficient of variation
N = number of Phase I, Stage 1 samples
n(α, d) = number of samples required for a probability α that the relative error in the estimate of the mean is ≥ d.
[shaded] = n(α, d) > N
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

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The number of samples collected is sufficient for aluminum, arsenic, beryllium, cobalt, copper, lead, mercury, selenium, silver, sodium, and zinc for $\alpha = 0.1$ and $d = 0.5$ (Table 4-9). Thus, the number of samples is sufficient for these metals if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean.

For mercury, selenium, and silver, twice the sample mean is less than either the RBC or the background $UTL_{99/99}$ (Section 3.1). Therefore, we can reasonably conclude that the number of samples collected is sufficient to characterize the mean values of these three metals at IHSS 208. RBCs are not available for aluminum, cobalt, lead, or sodium. For each of these metals, twice the sample mean is less than the background UTL.

Although the concentrations of these metals cannot be compared with RBCs, the number of samples collected should be sufficient to characterize the means because twice the mean is less than the UTL for each metal. Twice the sample mean exceeds the RBC but not the background UTL for arsenic and beryllium, and exceeds the background UTL but not the RBC for copper and zinc. Additional sampling will be required for these four metals. At least seven additional samples will be required for $\alpha = 0.1$ and $d = 0.3$.

4.3.13 IHSS 210 - Unit 16, Building 980 Cargo Container

Most of the SVOCs were not detected in any surface soil samples from IHSS 210. However, a few PAHs, phthalates, and other compounds were detected: 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 2,4-dimethylphenol, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, chrysene, di-n-butyl phthalate, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. No pesticides or PCBs were detected. Most of the metals were detected in most or all samples. Only cesium, molybdenum, tin, antimony, selenium, and thallium were not detected in any sample. Cyanide was not detected in any surface soil sample.

For the SVOCs that were detected, all but two were either detected in fewer than one-third of the samples, or were estimated at levels substantially lower than the detection levels for the majority of the data for that compound. The statistical assessment was completed for the other two chemicals: fluoranthene and pyrene. Of the metals that were detected, mercury and silver were detected in only one or two of the 10 samples and so they were not carried forward through the statistical assessment.

Statistical summaries of the data for the remaining chemicals are provided in Table 4-10. For $\alpha = 0.05$ and $d = 0.2$, the numbers of samples collected during Phase I, Stage 1 are sufficient for seven of the metals. However, if the statistical constraints are relaxed slightly, to $\alpha = 0.1$ and $d = 0.3$, then the number of samples collected are sufficient for all of the metals except cadmium, calcium, copper, nickel, sodium, and zinc.

The number of samples collected is sufficient for fluoranthene and pyrene for $\alpha = 0.1$ and $d = 0.5$ (Table 4-10). Thus, the number of samples is sufficient if we can accept a 90 percent confidence that the true population mean is less than twice the sample mean. For each of these compounds, twice the sample mean (381.8 μg/kg for fluoranthene and 500 μg/kg for pyrene) is several orders of magnitude less than the RBC (1.1×10^7 μg/kg and 8.23×10^6 μg/kg, respectively). Thus, accepting a lower confidence level of 90 percent and a larger relative error of the mean of 0.5 is not unreasonable, and it can be concluded that the number of surface soil samples collected from IHSS 210 is sufficient to characterize the mean values of the SVOCs within the IHSS.

For calcium, copper, nickel, sodium, and zinc, the number of samples collected is sufficient for $\alpha = 0.1$ and $d = 0.5$; for cadmium, the number of samples collected is sufficient for $\alpha = 0.2$

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TABLE 4-10
Statistical Summary of Phase I, Stage 1 Surface-Soil Data for IHSS 210

Semivolatiles (µg/kg)	Mean	Standard Deviation	η	N	n(.05, .2)	n(.1, .2)	n(.05, .3)	n(.1, .3)	n(.1, .5)	n(.2, .5)
Fluoranthene	190.90	175.90	0.921	10	82	57	36	26	9	6
Pyrene	250.00	177.15	0.709	10	48	34	21	15	5	3
Metals (mg/kg)										
Lithium	6.02	1.21	0.201	10	4	3	2	1	0	0
Strontium	19.90	10.16	0.510	10	25	18	11	8	3	2
Aluminum	5703.00	1395.38	0.245	10	6	4	3	2	1	0
Arsenic	2.51	0.60	0.240	10	6	4	2	2	1	0
Barium	53.43	11.07	0.207	10	4	3	2	1	0	0
Beryllium	0.32	0.11	0.356	10	12	9	5	4	1	1
Cadmium	0.97	1.06	1.090	10	114	80	51	36	13	8
Calcium	7755.00	6191.55	0.798	10	61	43	27	19	7	4
Chromium	20.31	10.42	0.513	10	25	18	11	8	3	2
Cobalt	4.39	1.60	0.365	10	13	9	6	4	1	1
Copper	28.08	18.67	0.665	10	42	30	19	13	5	3
Iron	12691.00	3967.45	0.313	10	8	7	4	3	1	1
Lead	27.67	9.99	0.361	10	13	9	6	4	1	1
Magnesium	2379.00	1084.28	0.456	10	20	14	9	6	2	1
Manganese	183.30	71.92	0.392	10	15	10	7	5	2	1
Nickel	16.84	10.21	0.606	10	35	25	16	11	4	2
Potassium	1562.00	293.36	0.188	10	3	2	2	1	0	0
Sodium	591.20	463.55	0.784	10	59	42	26	18	7	4
Vanadium	18.69	5.61	0.300	10	9	6	4	3	1	1
Zinc	106.41	80.26	0.754	10	55	38	24	17	6	4

Notes:

η = coefficient of variation
N = number of Phase I, Stage 1 samples
n(α, d) = number of samples required for a probability α that the relative error in the estimate of the mean is ≥ d.
[shaded] = n(α, d) > N
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram

and d = 0.5 (Table 4-10). Thus, the number of samples is sufficient if we can accept an 80 percent confidence that the true population mean is less than twice the sample mean for cadmium, and a 90 percent confidence that the true population mean is less than twice the sample mean for calcium, sodium, and zinc.

For cadmium, copper, nickel, and zinc, twice the sample means are several orders of magnitude less than their respective RBCs (Section 3.1). Twice the sample mean is also less than the background $UTL_{99/99}$ for cadmium, although the sample mean exceeds the background UTL for copper and zinc, and twice the sample mean exceeds the background UTL for nickel. Because the sample means are so much lower than the RBCs for these metals, increasing the allowable relative error to 0.5 appears to be reasonable.

For both calcium and sodium, the sample means are less than the background UTLs, while twice the sample means are greater than the UTLs. These metals have no RBCs, so twice the sample means cannot be compared with RBCs. However, since the coefficients of variation for the calcium and sodium distributions are similar to those for cadmium and zinc (Table 4-10), it is probable that a sufficient number of samples has been collected for calcium and sodium for $\alpha = 0.1$ and d = 0.5.

4.3.14 IHSS 213 - Unit 15, 904 Pad Pondcrete Storage

No surface-soil samples were collected at IHSS 213.

4.3.15 IHSS 214 - Unit 25, 750 Pondcrete and Saltcrete Storage

No surface-soil samples were collected at IHSS 214.

5.0 PRELIMINARY EVALUATION OF NATURE AND EXTENT OF CONTAMINATION

This section uses the surface-soil and soil-gas data to provide a preliminary evaluation of the nature and extent of contamination at each IHSS. Factors affecting chemical fate and transport in the environment are first introduced and discussed in general terms. The type of contaminants and apparent migration pathways at each site are then identified to characterize the nature and extent of contamination. This information is used in Section 6.0 to make recommendations for further investigation.

5.1 CHEMICAL FATE AND TRANSPORT

An evaluation of the fate and transport of the chemicals detected at a site aids in predicting potential exposure pathways and helps link sources with contaminated media. When a chemical is released to the environment, the chemical fate may be one of the following:

- transport (e.g., convected downstream in water flow, on suspended sediment, or on airborne particulates through the atmosphere);
- physical transformation (e.g., volatilization, precipitation);
- chemical transformation (e.g., photolysis, hydrolysis, oxidation, reduction, or other means of chemical transformation);
- biological transformation (e.g., biodegradation); and/or
- accumulation in one or more media (including the receiving medium).

Site-specific characteristics may influence chemical fate and transport, particularly the properties of the environmental media in which a contaminant occurs. Soil characteristics such as moisture content, organic carbon content, and cation exchange capacity can greatly influence chemical movement. Other site characteristics that are considered in the characterization of the physical setting and discussed in the work plan (DOE 1992a) are as follows:

- climate (temperature and precipitation);
- meteorology (wind speed and direction);
- geologic setting (location and characterization of underlying strata);
- vegetation (unvegetated, forested, grassy);
- soil type (sandy, organic, acid, basic);
- groundwater hydrology (depth, direction, and type of flow); and
- location and description of surface water (type, flow, rates, and salinity).

Two samples that are representative of the soil types observed in each IHSS were analyzed for moisture content, grain-size distribution, bulk density, and specific density (gravity). These analyses are described below:

- Soil Moisture Content. Soil moisture content is expressed as a ratio of mass of water present in the sample to a mass of sample after it has been dried to a constant mass. The value is a dimensionless ratio that can be expressed as a percentage by multiplying the ratio by 100.

- Grain-Size Distribution. Grain-size distribution is also referred to as particle-size distribution and is the measurement of the proportion of the various sizes of primary soil particles.

- Soil Bulk Density. Soil bulk density is defined as the ratio of a mass of oven-dried solids to a bulk volume of solids plus pore space for soil water content during sampling.

- Specific Density. Specific density, otherwise known as specific gravity or particle density, is density of soil particles; no account is taken of volume of voids between the particles (Carter 1993).

The particle density of many soils averages approximately 2.65 grams per cubic centimeter (g/cm^3). The average for peat soils is much lower. The bulk density of most soils ranges from 1.0 gm cm^{-3} for clays to 1.8 gm cm^{-3} for sands (Carter 1993). At Rocky Flats, the native surface soil is alluvium that varies greatly in grain size distribution and sand or clay content. Often the surface material that was encountered was fill material instead of native soil. Fill material typically exhibits a more even grain size distribution and a lower clay content.

Physical parameters for soil types encountered during surface sampling are presented in Table 5-1. A total of 19 surface-soil sample locations were characterized for specific gravity by American Society for Testing and Materials (ASTM) Method D854, texture by ASTM Method D422, percent moisture by ASTM Method D2216 (ASTM 1992), and bulk density by the Clod Method (Black 1965). Additionally, four surface-soil samples at each IHSS were chosen for analysis of TOC and pH. TOC and pH results are presented in Table 5-2.

The specific gravity, percent moisture, bulk density, TOC, and pH are used to qualitatively describe the potential for contaminant transport through different media. In addition these properties are used in estimating various transport coefficients for contaminants in saturated and unsaturated media. To complete the calculations of some of the transport coefficients, percent porosity and hydraulic conductivity values are needed. Soil volumes were not collected for porosity and hydraulic conductivity during Phase I, Stage 1 field sampling because subsurface

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TABLE 5-1
OU10 Physical Parameter Data

	IHSS	129	129	170	170	174A	174A	174B	174B	175	175	176
	LOCATION	SS016493	SS016793	SS005393	SS005393	SS001293	SS002193	SS003893	SS004293	SS012593	SS012793	SS008693
	SAMPLE NUMBER	SSG1255JE	SSG1256JE	SSG1151JE	SSG1152JE	SSG1153JE	SSG1154JE	SSG1155JE	SSG1156JE	SSG1157JE	SSG1158JE	SSG1159JE
PHYSICAL PARAMETER												
	UNIT											
SPECIFIC GRAVITY	g/cm³	2.8	2.6	2.6	2.2	2.4	1.7	2.6	2.6	2.6	2.7	2.6
MAXIMUM (BULK) INDEX DENSITY	g/cm³	1.1	1.0	1.3	1.1	1.2	1.2	1.3	1.3	1.3	1.0	1.3
SOIL AND GRAIN SIZE CLASSIFICATION	TEXT	SANDY LOAM	LOAMY SAND	LOAMY SAND	LOAMY SAND	LOAMY SAND	LOAMY SAND	LOAMY SAND	LOAMY SAND	SANDY CLAYEY LOAM	SANDY CLAYEY LOAM	LOAMY SAND
% CLAY (<0.002 mm)	%	8.0	8.0	1.0	1.0	6.0	3.0	4.0	3.0	20.0	20.0	7.0
% SILT (0.002 - 0.62 mm)	%	14.0	16.0	18.0	15.0	11.0	9.0	20.0	20.0	23.0	25.0	11.0
% SAND (0.062 - 2.0 mm)	%	79.0	76.0	81.0	84.0	83.0	88.0	76.0	77.0	58.0	55.0	81.0
% MOISTURE	%	6.4	3.9	1.4	0.5	1.7	0.3	0.4	0.5	2.0	1.3	0.6

	IHSS	176	177	177	206	206	208	208	210	210
	LOCATION	SS008793	SS013493	SS013793	SS011293	SS011493	SS013993	SS014093	SS015993	SS016093
	SAMPLE NUMBER	SSG1160JE	SSG1226JE	SSG1227JE	SSG1199JE	SSG1200JE	SSG1224JE	SSG1225JE	SSG1228JE	SSG1229JE
PHYSICAL PARAMETER										
	UNIT									
SPECIFIC GRAVITY	g/cm³	2.2	2.5	2.4	2.6	2.6	2.7	2.7	2.3	2.7
MAXIMUM (BULK) INDEX DENSITY	g/cm³	1.3	1.0	1.0	1.3	1.3	1.1	1.2	1.2	1.3
SOIL AND GRAIN SIZE CLASSIFICATION	TEXT	LOAMY SAND	LOAM	LOAM	SANDY LOAM	SAND	LOAMY SAND	SANDY LOAM	LOAMY SAND	SANDY CLAYEY LOAM
% CLAY (<0.002 mm)	%	7.0	16.0	24.0	10.0	2.0	6.0	8.0	11.0	4.0
% SILT (0.002 - 0.62 mm)	%	13.0	35.0	36.0	16.0	11.0	20.0	18.0	24.0	19.0
% SAND (0.062 - 2.0 mm)	%	80.0	49.0	40.0	74.0	86.0	74.0	74.0	65.0	78.0
% MOISTURE	%	0.7	2.3	3.0	0.8	0.9	0.5	0.5	0.9	0.4

Notes:

g/cm³ = gram per cubic meter
% = percent
mm = milimeter
< = less than

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TABLE 5-2
Total Organic Carbon and pH for Surface-Soil Samples
OU10

IHSS			170	170	170	170	174A	174A
	MDL	RBC/BKGND						
Sample Location			SS005093	SS005593	SS006093	SS007693	SS001093	SS002193
Sample Identification Number			SSG1049JE	SSG1054JE	SSG1059JE	SSG1075JE	SSG1077JE	SSG1088JE
Date Sampled			29-Dec-93	6-Jan-94	4-Jan-94	11-Jan-94	22-Dec-93	16-Dec-93
Test Group: WQPL Units:µg/g								
TOTAL ORGANIC CARBON	5.0	0.00/0.00	10600:V-	16100G:JA-	16500G:JA-	5280:V-	14700G:JA	16800G:JA-
pH	0.1	N/A	6.100:V	5.180:V	6.930:V	7.790:V	4.220:V	5.010:JA

TABLE 5-2
Total Organic Carbon and pH for Surface-Soil Samples
OU10

IHSS			174A	174A	174B	174B	174B	174B
	MDL	RBC/BKGND						
Sample Location			SS002793	SS003493	SS003693	SS003893	SS003993	SS004093
Sample Identification Number			SSG1094JE	SSG1101JE	SSG1103JE	SSG1105JE	SSG1106JE	SSG1107JE
Date Sampled			15-Dec-93	14-Dec-93	12-Jan-94	12-Jan-94	13-Jan-94	19-Jan-94
Test Group: WQPL Units:µg/g								
TOTAL ORGANIC CARBON	5.0	0.00/0.00	N/A	N/A	16800G:JA-	11700:V-	8320:V-	5490:V-
pH	0.1	N/A	6.360:JA	6.120:JA	5.910:V	6.180:V-	5.950:V	6.010:V

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TABLE 5-2
Total Organic Carbon and pH for Surface-Soil Samples
OU10

IHSS			175	175	175	175	176	176
	MDL	RBC/BKGND						
Sample Location			SS011993	SS012193	SS012293	SS012393	SS007993	SS008393
Sample Identification Number			SSG1202JE	SSG1204JE	SSG1205JE	SSG1206JE	SSG1162JE	SSG1166JE
Date Sampled			21-Feb-94	21-Feb-94	21-Feb-94	17-Feb-94	7-Feb-94	7-Feb-94
Test Group: WQPL Units:µg/g								
TOTAL ORGANIC CARBON	5.0	0.00/0.00	3120:V	4030:V	3460:V-	8620:V	18200G:JA	19100G:JA
pH	0.1	N/A	8.190:V	8.390:V	8.490:V-	8.380:V	8.300:V	8.1100:V

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TABLE 5-2
Total Organic Carbon and pH for Surface-Soil Samples
OU10

IHSS			176	176	177	177	177	177
	MDL	RBC/BKGND						
Sample Location			SS009293	SS009493	SS012893	SS012993	SS013393	SS013393
Sample Identification Number			SSG1175JE	SSG1177JE	SSG1211JE	SSG1212JE	SG1216JE	SSG1304JE
Date Sampled			2-Feb-94	9-Feb-94	22-Jul-94	25-Jul-94	26-Jul-94	26-Jul-94
Test Group: WQPL Units:µg/g								
TOTAL ORGANIC CARBON	5.0	0.00/0.00	13900:V-	2830:V-	1490:V	2490:V	13700:V-	9270:V
pH	0.1	N/A	8.430:V	8.350:V	8.680:V	8.340:V	8.330:V	N/A

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TABLE 5-2
Total Organic Carbon and pH for Surface-Soil Samples
OU10

IHSS			177	206	206	206	206	206
	MDL	RBC/BKGND						
Sample Location			SS013793	SS010693	SS011193	SS011493	SS011493	SS011593
Sample Identification Number			SSG1220JE	SSG1189JE	SSG1194JE	SSG1197JE	SSG1301JE	SSG1198JE
Date Sampled			28-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94	21-Jul-94
Test Group: WQPL Units:µg/g								
TOTAL ORGANIC CARBON	5.0	0.00/0.00	16600:V	2760:V-	2540:V	2150:V	2480:V	6090:V
pH	0.1	N/A	7.340:V	8.760pH	8.260:V	8.840:V	N/A	7.660:V

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TABLE 5-2
Total Organic Carbon and pH for Surface-Soil Samples
OU10

IHSS			208	208	208	208	208	208
	MDL	RBC/BKGND						
Sample Location			SS013893	SS013993	SS014093		SS013993	SS014093
Sample Identification Number			SSG1221JE	SSG1222JE	SSG1223JE		SSG1307JE	SSG1223JE
Date Sampled			27-Jul-94	27-Jul-94	27-Jul-94		27-Jul-94	27-Jul-94
Test Group: WQPL Units:µg/g								
TOTAL ORGANIC CARBON	5.0	0.00/0.00	4010:V	16300E:JA	N/A		16300E:JA	16300E:JA
pH	0.1	N/A	6.840:V	6.600:V	6.710		N/A	N/A

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TABLE 5-2
Total Organic Carbon and pH for Surface-Soil Samples
OU10

IHSS			210	210	210	210	210
	MDL	RBC/BKGND					
Sample Location			SS015193	SS015593	SS015793	SS016093	SS015693
Sample Identification Number			SSG1234JE	SSG1238JE	SSG1240JE	SSG1243JE	SSG1239JE
Date Sampled			24-Feb-94	22-Feb-94	23-Feb-94	22-Feb-94	22-Feb-94
Test Group: WQPL Units:µg/g							
TOTAL ORGANIC CARBON	5.0	0.00/0.00	4040:V-	5450:V-	16600:V-	6670:V	
pH	0.1	N/A	N/A	8.770:V	8.250:V	8.700:V	8.550:V

Notes:

A = Validation Qualifier: laboratory qualifier considered acceptable
BKGND = background
IHSS = Individual Hazardous Substance Site
J = Laboratory Qualifier: estimated value
MDL = Method Detection Limit
RBC = risk-based concentrations
V = Validation Qualifier: valid data
µg/g = micrograms per gram

samples were not collected. Intrusive sampling will be conducted during Phase I, Stage 2 field activities, and undisturbed subsurface soil will be analyzed for physical parameters including hydraulic conductivity and porosity. The specific gravity, percent moisture, bulk density, TOC, and pH presented in Tables 5-1 and 5-2 of this report along with new data from Phase I, Stage 2 field activities will be interpreted in the fate and transport section of the Phase I, Stage 2 technical memorandum.

Soil matrix texture was classified using ASTM Method D422. The sample matrix that excludes particles greater than 2 millimeter (mm) in diameter ranges from a sand or loamy sand to a sandy clayey loam or loam. The percentage of sand ranges from a minimum of 40 percent in IHSS 177 to a maximum of 88 percent in IHSS 174A. An overall average of 74 percent sand is estimated for the soil matrix at all the OU10 IHSSs.

Soil pH can influence chemical speciation reactions such as oxidation-reduction, ligand exchange, chemical precipitation, and adsorption. This is generally dependent on the contaminant or mixture of contaminants present and the moisture content of the soil. The results of TOC analyses provide an indication of the organic content of the soil, which can greatly influence chemical accumulation in the soil by way of adsorption and reduce the likelihood of extensive chemical movement, depending on the adsorptivity of the particular chemical.

Important physical and chemical properties considered when assessing contaminant migration at a site are defined below:

- $\underline{K_{oc}}$. K_{oc} (organic carbon partition coefficient) provides a measure of the extent of chemical partitioning between organic carbon and water at equilibrium. The higher the K_{oc}, the more likely a chemical is to bind to soil or sediment than to remain in water.

- K_d. K_d (distribution coefficient) provides a soil or sediment-specific measure of chemical partitioning between soil or sediment and water. The higher the K_d, the more likely a chemical is to bind to soil or sediment than to remain in water.

- K_{ow}. K_{ow} (octanol-water partition coefficient) provides a measure of the extent of chemical partitioning between water and octanol at equilibrium. The greater the K_{ow}, the more likely a chemical is to partition to octanol than to remain in water. Octanol is used as a surrogate for lipids (fat), and K_{ow} can be used to predict bioconcentration in aquatic organisms.

- Solubility. Solubility is an upper limit on a chemical's dissolved concentration in water at a specified temperature. Aqueous concentrations in excess of solubility may indicate sorption onto sediments, the presence of solubilizing chemicals such as solvents, or the presence of a nonaqueous phase liquid.

- Henry's Law Constant. Henry's Law constant provides a measure of the extent of chemical partitioning between air and water at equilibrium. The higher the Henry's Law constant, the more likely a chemical is to volatilize than to remain in the water.

- Vapor Pressure. Vapor pressure is the pressure exerted by a chemical vapor in equilibrium with its solid or liquid form at any given temperature. It is used to calculate the rate of volatilization of a pure substance from a surface or in estimating a Henry's Law constant for chemicals with low water solubility. The higher the vapor pressure, the more likely a chemical is to exist in a gaseous state.

- Diffusivity. Diffusivity describes the movement of a molecule in a liquid or gas medium as a result of differences in concentration. It is used to calculate the dispersive component of chemical transport. The higher the diffusivity, the more likely a chemical is to move in response to concentration gradients.

- Bioconcentration Factor (BCF). The bioconcentration factor provides a measure of the extent of chemical partitioning at equilibrium between a biological medium such as fish tissue or plant tissue and an external medium such as water. The higher the BCF, the greater the accumulation in living tissue is likely to be.

- Media-Specific Half-life. The media-specific half-life provides a relative measure of the persistence of a chemical in a given medium, although actual values can vary greatly depending on site-specific conditions. The greater the half-life, the more persistent a chemical is likely to be.

5.1.1 Chemical-Specific Information

Chemical persistence in the environment is influenced by various physical, chemical, and biological processes that can affect the chemical as it moves through air, soil, or water systems. These processes include photolysis, hydrolysis, volatilization, sorption, bioaccumulation, and biotransformation or biodegradation. As discussed in Section 3.0, contaminants found at OU10 IHSSs primarily are PAHs, PCBs (Aroclor-1254 or -1260), VOCs, and various metals. The following paragraphs provide chemical-specific information related to contaminant fate and transport. The information was obtained from chemical-specific toxicological profiles available from the Agency for Toxic Substances and Disease Registry (ATSDR 1990) and other EPA-approved resources.

5.1.1.1 Polynuclear Aromatic Hydrocarbons

PAHs are a class of compounds consisting of substituted and unsubstituted polycyclic aromatic rings commonly formed by the incomplete combustion of coal, oil and gas, garbage, or other organic materials. PAHs are found in crude oil, coal, coal-tar pitch, creosote, and road and roofing tars. Their chemical, physical, and biological properties vary with their molecular weight and structure. Solubility generally decreases with increasing molecular weight. Less soluble PAHs are more likely to remain in the soil.

Adsorption to organic material in soil, as well as to sediment and suspended matter in aquatic media, is common for the PAHs. The degree of adsorption will depend on the amount of organic matter in the specific medium and the particular PAH's affinity to organic matter. Adsorption can impede the migration of PAHs to groundwater, particularly in soils with high organic content. Atmospheric transport of PAHs may occur by adsorption onto airborne particulate matter.

Biodegradation and biotransformation are probably the ultimate fate processes for PAHs in soil. They are quickly metabolized and eliminated from most organisms. Bioaccumulation, especially in vertebrate organisms, is usually short-term and is not considered an important fate process in most multicellular organisms. Higher molecular weight PAHs are degraded slowly by microbes and are readily metabolized by multicellular organisms. Microbes appear to degrade PAHs much more completely than mammals. The half-life of PAHs in soils can range from less than one day to several years.

5.1.1.2 Polychlorinated Biphenyls (PCBs)

PCBs are complex mixtures of chemicals composed of two connected benzene rings with one to 10 chlorine atoms attached. The chemical, physical, and biological properties of these materials depend to a large degree on the amount and location of the chlorine atoms on the two benzene rings of each specific PCB and on the particular mixture of individual chlorobiphenyls that comprise the mixture. Aroclor is the most familiar trademark of PCBs in the United States. All Aroclor products are characterized by a four-digit number in which the first two digits represent the type of molecule (i.e., 12 represents chlorinated biphenyl). The last two digits give the weight percent of chlorine. The fire-resistant nature and thermal stability of PCBs made them useful as hydraulic and heat transfer fluids in the past. Their production in the United States ceased in 1977.

PCBs are very persistent in the natural environment. They are colorless oils, with increasing chlorine content resulting in mixtures with increasing viscosity. They have low water solubility, although they are soluble in oils and organic solvents. Despite their low vapor pressures, they have a high activity coefficient in water, which causes a higher rate of volatilization than might be expected. Environmental fate mechanisms generally depend on the degree of chlorination, with persistence generally increasing with increased chlorination. Higher chlorinated biphenyls, such as Aroclor-1254 and -1260, are resistant to biodegradation. Less heavily chlorinated PCBs can be biodegraded by some soil microorganisms. The heavier PCBs can be photolyzed by ultraviolet light. Although this process is extremely slow, it may be the most important degradation process for these very persistent compounds.

PCBs adsorb tightly to organic matter in the soil, with adsorption increasing with the degree of chlorination. This probably is the major fate of at least the more heavily chlorinated PCBs. Once bound, the PCBs may persist for years with slow desorption providing continuous, low-level exposure to the surrounding locality. Vapor loss from soil appears to be an important fate mechanism with the rate of volatilization decreasing with increasing chlorination. PCBs will not leach significantly to the groundwater, although the presence of organic solvents in soils may allow co-solvency and resultant leaching.

5.1.1.3 Volatile Organic Compounds

Acetone. Acetone is a commonly used solvent that is not very persistent in the environment. If released to soil, acetone will probably volatilize or leach to the groundwater. It is highly water-soluble, which may limit volatilization. Acetone biodegrades readily due to its aliphatic nature. Bioconcentration is probably not significant. In the atmosphere, acetone will be lost through photolysis and reaction with photochemically produced hydroxyl radicals. Acetone does not adsorb appreciably to soil. Because of its high vapor pressure and low adsorption to soil, it readily evaporates from the soil surface.

Benzene. Benzene is an industrial solvent and chemical intermediate. It is a colorless liquid with a sweet odor and is highly flammable. Benzene is found in nature as a component of crude oil. It will rapidly volatilize from soil surfaces, but is highly mobile in soil systems and can also leach to groundwater. It is soluble in water (log K_{ow} equals 2.1) and can be a cosolvent with alcohol, chloroform, acetone, carbon tetrachloride, and ether. Adsorption onto organic matter may be significant under conditions of constant exposure, and sorption processes are probable removal mechanisms in both surface water and groundwater. Atmospheric destruction of benzene is the most likely fate process. Biodegradation can occur in aerobic conditions after bacteria become acclimated to the benzene. The rate of benzene biodegradation may be enhanced by the presence of other hydrocarbons. Bioconcentration potential appears to be low.

1,2-Dichloroethene. 1,2-DCE is a highly flammable, colorless liquid with a sharp, harsh odor. It is used most often in the production of solvents and in chemical mixtures and may occur as a breakdown product (through removal of halogen by anaerobic degradation) of common industrial solvents such as TCE, PCE, and 1,1,1-TCA. This may be apparent when it is found in increasing concentrations away from the source area and in locations where there are high concentrations of degradable organic compounds.

If released to soil, 1,2-DCE will volatilize or seep into soil and eventually leach to groundwater. It normally will biodegrade slowly in groundwater where it takes 13 to 48 weeks for half of it to break down. 1,2-DCE does not bioconcentrate significantly in aquatic organisms. The chemical should not adsorb significantly to soil or sediment.

Ethylbenzene. Ethylbenzene is a naturally occurring substance in crude oil and is a component of automotive and aviation fuels. It is used as a solvent and for the production of styrene. Ethylbenzene is a colorless liquid that is soluble in ethyl alcohol and ethyl ether. Volatilization is probably the major route of elimination from surface water. Subsequent atmospheric reactions, especially photooxidation, are responsible for its fate. It is photochemically reduced in the atmosphere to ethylphenol, benzaldehyde, acetophenone, and ethylnitro benzene. Ethylbenzene rapidly volatilizes from water and soil systems and will biodegrade after an acclimation period for microorganisms. A significant amount of ethylbenzene may be adsorbed by organic material in sediment or soil. Leaching to groundwater can occur in soils with a low organic matter content.

Tetrachloroethene (PCE). PCE is a colorless liquid that is widely used for dry-cleaning fabrics and for metal degreasing operations. It is also used as a starting material for making other chemicals. It has a sharp, sweet odor and is corrosive to some metals in the presence of water. Volatilization is an important environmental fate process for PCE and it will eventually undergo photooxidation in the atmosphere. It is miscible with hexane, alcohol, benzene, chloroform, and most oils but is not very soluble in water. In soils with a low organic matter content, PCE will leach into the groundwater. In soils with high levels of organics, PCE adsorbs to these materials and can be bioaccumulatted. It is unclear if PCE bound to organic material can be degraded by microorganisms. Biodegration to vinyl chloride, trichloroethylene, and dichloroethylene will occur in anaerobic conditions.

Toluene. Toluene is a clear liquid that is often used as an industrial solvent. It is a naturally occurring component of crude oil. Volatilization and biodegradation are the major fate and transport processes for toluene. Photooxidation is the primary atmospheric fate process for toluene, and benzaldehyde is reported to be the principal organic product. Sorption processes may also be significant. Bioaccumulation is not an environmental fate process.

1,1,1-Trichloroethane (1,1,1-TCA). 1,1,1-TCA is often used as a solvent to dissolve other substances, such as glue and paint. In industry it is widely used to remove oil or grease from manufactured metal parts. The compound 1,1,1-TCA can occur as a degradation product of 1,1,2,2-tetrachloroethane. At normal temperatures, 1,1,1-TCA is a nonflammable, colorless, volatile liquid (Merck 1989). Because of its volatile nature, transport from surface soils to the atmosphere will occur rapidly. Photooxidation occurs via reactions with hydroxyl radicals and is probably the principal fate process. Although there are substantial differences in reported solubility in the literature, the solubility is relatively high.

Soil sorption is not expected to be strong enough to prevent migration of 1,1,1-TCA into groundwater. Decomposition of 1,1,1-TCA by hydrolysis can occur, resulting in production of acetic acid. Methane-producing bacteria may anaerobically dechlorinate 1,1,1-TCA to 1,1-DCA and then to chloroethane (ATSDR 1990).

Trichloroethene (TCE). TCE is a stable, nonflammable, colorless, volatile liquid at ambient temperatures (Merck 1989). It is used as a solvent for resins, oils, rubber, paints, and varnishes. It is also used for solvent extraction, degreasing, dry cleaning, and manufacturing of organic chemicals and pharmaceuticals (Merck 1989). TCE may result from the degradation of either PCE or tetrachloroethane (PCA).

Volatilization is the most important environmental fate process for TCE. Once in the atmosphere, it reacts with hydroxyl radicals to produce hydrochloric acid, carbon monoxide, carbon dioxide, and carboxylic acid. The amount of volatilization is not affected by soil sorption (EPA 1985). It does, however, adsorb to organic materials and can be bioaccumulatted. Because it is very soluble, it will move to groundwater very quickly. Under anaerobic conditions, TCE biodegrades first to DCE and subsequently to vinyl chloride; it can be a considerable source for these compounds.

Xylene. Xylene is used in the production of benzoic acid, gasoline, perfumes, and insect repellents. It is also used as a solvent for herbicides and enamel paints. Xylene is a clear liquid under normal environmental conditions and can be corrosive to some plastics and rubber. Xylene occurs naturally in petroleum reserves and as a combustion product of forest fires.

Volatilization is the major fate and transport process for xylene. Xylene is photochemically reduced once it is released to the atmosphere; it is degraded photochemically in the atmosphere to compounds such as nitrophenols, aerosols, and benzaldeydes. Xylene is mobile in soils systems and will leach to groundwater. It will not significantly bioconcentrate in aquatic organisms. Xylene is moderately soluble in water and can leach into the ground in areas of high concentration.

5.1.1.4 Phthalate Esters

Phthalate esters such as bis(2-ethylhexyl) phthalate and dibutylphthalate are widely used in the manufacture of PVC, lacquers, nail polish, insect repellent, desensitizer for explosives, photographic film, and adhesives. They are in a liquid form under normal environmental conditions and have a characteristic odor.

In general, phthalate esters have low water solubilities. However, co-solvency effects may occur in mixtures of dibutylphthalate with acetone, benzene, alcohol, or ether and in mixtures of bis(2-ethylhexyl) phthalate with mineral oil and hexane. Volatilization rates are negligible in soil and water systems.

Microbial degradation is a primary fate process of bis(2-ethylhexyl) phthalate and dibutyl phthalate when in contact with soil surfaces. Bis(2-ethylhexyl) phthalate will not leach or volatilize from soil surfaces but dibutyl phthalate can leach into the groundwater in areas of high infiltration rates. Phthalate esters will adsorb onto sediments and suspended material in water systems. Microbial biodegradation will occur in aerobic conditions with a slower rate of degradation in seawater than in freshwater.

5.1.1.5 Metals

Metals in the environment are most affected by transport, speciation, partitioning, and transformation processes. However, degradation of organometallic complexes and alteration of metallic species in the environment can also occur. Metal compounds released to unsaturated surface soils will most commonly exist adsorbed onto soil particles or in the soil moisture. Dissolution of metals is dependant on the metals speciation, pH, Eh, complexing ions, and associated solubility. Species transformation in the environment may alter the solubility and ultimate fate of the compound.

5.2 SUMMARY OF IHSS-SPECIFIC FINDINGS

The nature and extent of contamination at each IHSS is characterized in the following subsections. Information from the data summary and graphical presentation of the data in the attached plates were used to delineate areas of concern and examine contaminant migration at each IHSS.

5.2.1 IHSS 129 - Oil Leak

Recommendations for IHSS 129 will be included in the Final Draft Technical Memorandum.

5.2.2 IHSS 170 - Property Utilization and Disposal Storage Yard

The topography of IHSS 170 gently slopes to the northeast and east. Surface soils in the area consist primarily of fill. This material and 35 to 55 feet of Rocky Flats alluvium overlie the Arapahoe formation in the vicinity of the PUD Storage Yard. Groundwater is at a depth of approximately 10 feet and flows northeast, probably intercepting the groundwater extraction system of the present landfill on the north tributary of Walnut Creek (DOE 1992a). Previous soil investigations have not been conducted at IHSS 170.

Plate 3 shows concentration plots of detected analytes at IHSS 170. Of the organic chemicals found in surface soil at the site, PAHs were detected most frequently. The PAHs that were detected throughout the site are likely associated with past storage and handling of waste oils at the site. Highest concentrations of PAHs were reported along the northeastern border. Lower concentrations appear in the central portion of the site and toward the southeast. These chemicals normally will adsorb to the soil and will migrate with any blowing dust or soil erosion in the area. However, no pattern of PAH migration is apparent, other than possible migration toward the east which may be due to wind transport. Other organics (4-chloro-3-methylphenol and bis[2-ethylhexyl]phthalate, for example) were detected in surface soils less frequently and do not contribute to the characterization of contaminant transport at IHSS 170.

Volatiles detected in soil-gas sampling appear to be concentrated along the eastern site boundary, downgradient of the stained area (Plate 4). These chemicals are generally more soluble than the PAHs and will migrate with subsurface drainage or groundwater flow. Given known information regarding the hydraulic gradient in the area of IHSS 170 and the hydraulic conductivity of the Rocky Flats Alluvium (DOE 1992a) and assuming a soil porosity of 0.3, an estimated flow rate of 0.5 to 50 feet per year was determined. Furthermore, operations at the site occurred as long ago as 20 years (1974) with materials containing solvents stored and transferred onsite. The area of subsurface volatile contamination may, therefore, be associated with past operations at the site or any spill-related event in the area of stained soil.

5.2.3 IHSS 174 - Property Utilization and Disposal Container Storage Facilities

IHSSs 174A and 174B are separate small portions of the rectangular area designated as IHSS 170. Physical characteristics of the two smaller sites are similar to those of IHSS 170. PAHs were the most frequently detected surface soil contaminants at both 174A and 174B (as at IHSS 170) and these data are used to define contaminant migration occurring at the two sites. These contaminants are consistent with oil wastes historically stored at the two sites. Aroclor-1254 and -1260 (PCBs) were also detected and are included in the assessment of contaminant migration.

Plates 5 and 6 show concentration plots of chemicals detected at IHSSs 174A and 174B, respectively. The high concentrations of PAHs detected along the northern border of IHSS 174B and in the northwestern corner of IHSS 174A coincide with concentrations exceeding the RBC in the neighboring IHSS 170 (Plate 3). Similar concentrations were found on either side of IHSS 174B along the northern boundary and along a northeasterly line extending from the southern IHSS 170 boundary. Within the three IHSSs, PCBs as Aroclor-1254 and -1260 were detected at 11 locations: two within IHSS 170, four in the northern half of IHSS 174A, and at five of the eight locations in IHSS 174B. The PCBs are very persistent in the environment and will generally adsorb to organic material in the soil. The compounds may become soluble, however, in a hydrocarbon mixture. Aroclor-1260 was found only at IHSS 174B while Aroclor-1254 was detected at IHSSs 170 and 174A.

Separate source areas of PAH contamination may exist within the three IHSSs. Based on the data evaluation, two areas of concern can be delineated for the PAHs: one along the northern boundary of IHSSs 170 and 174B and a second area extending from the southeastern portion of IHSS 170 into the northwestern portion of IHSS 174A. Concentrations of PAHs were not as high and PCBs were not detected in the central region of IHSS 170 that separates these two areas of concern. Information regarding past soil removal in the central area was not available. PCBs appear to be following a similar migration pathway as the PAHs from IHSS 170 into 174A (Plates 3 and 5). PCBs were also found at levels of concern at IHSS 174B but did not appear southeast in the IHSS 170 central region (Plates 3 and 6).

Concentrations of a number of metals exceeded background within IHSS 170, although only copper and zinc exceeded background at IHSS 174B. Most of the metals exceeding background at IHSS 170 may be associated with fill material possibly placed at the site. At IHSS 174A, beryllium, vanadium, lead, chromium, and copper were above background, mostly at locations in the northeastern corner of the site. Lead levels above background also occurred in the south central region of IHSS 174A and south of the stained area in the central area of IHSS 170. Most of the metals are insoluble in the environmental conditions present at OU10 (soils are of neutral or basic pH) and will remain in the upper soil layer unless another component reacts with the metals (e.g., acids) and transforms them to a more mobile form.

Soil-gas sampling of IHSSs 174A and 174B did not reveal potential sources of volatile contamination. One location where PCE was found along the northern boundary of IHSS 174A can be associated with the plume identified in the IHSS 170 soil-gas data.

Data from previous investigations of the two IHSSs are verified by the current sampling data. Organics found in the 1988 soil characterization effort were again detected at locations within IHSSs 170, 174A, and 174B. These organics include acetone, PCE, and 1,1,1-TCA detected during the recent soil-gas sampling effort and 4-chloro-3-methylphenol and bis(2-ethylhexyl) phthalate detected in surface soils.

5.2.4 IHSS 175 - Swingerton and Walberg Building 980 Container Storage Facility

The topography of IHSS 175 gently slopes to the northeast and more steeply to the east. At the southern edge of the IHSS, the topography drops steeply down a hillside to the south into a drainage. Depth to groundwater and alluvial materials is similar to IHSSs 170, 174A, and 174B, except that the groundwater depth is at 15 feet rather than 10 feet below the surface. Groundwater in the vicinity of IHSS 175 flows to the east following the slope of the weathered bedrock surface and probably intercepts the South Walnut Creek drainage (DOE 1992a).

Consistent with wastes stored at the site, PAHs were the most frequently detected organic chemicals in surface soils at the site. A few phthalate esters and benzoic acid were detected less frequently. Concentrations were highest in the southern portion of the site, south of the southern edge of the storage yard south of Building 980 (Plate 8). Contaminant migration in surface soils appears to be occurring to the south down the hillside with possible surface erosion. The PAHs detected in the northeast corner are likely associated with airborne transport. As discussed earlier, PAHs tend to adsorb to soil organic matter in the soil. Transport will most likely occur by way of fugitive dust or erosion.

Metals exceeding background also occurred within the site (Plate 8). Calcium, chromium, copper, mercury, nickel, and zinc were found at concentrations greater than background. These inorganics may, however, be associated with fill material that might have been placed in the site area. Calcium levels were approximately 10 times greater in the southern portion than in other portions of the site. Other metals detected above background were of concentrations in the same order of magnitude as the background levels, however.

VOCs detected above the target detection limit during soil-gas sampling were limited to cis-1,2-dichloroethene at only one location, in the northwestern corner of the site (Plate 9). Levels were not reported above the target detection limit for any other VOCs. Cis-1,2-dichloroethene, like most VOCs, is readily soluble and will migrate toward the groundwater with infiltration of rainfall. This may be what has occurred in the past at the site. Any other volatile contaminants would also have migrated toward the groundwater with infiltrating rainfall.

5.2.5 IHSS 176 - Swingerton and Walberg Contractor Storage Yard

The ground surface gently slopes to the east-northeast at IHSS 176. Approximately 15 feet of alluvium and fill overlie the bedrock in the vicinity of the site. Alluvium observed in Well 2886 located 100 feet north of IHSS 176 consisted of a thin cobble layer resting atop claystone of the Arapahoe formation that was then overlain by approximately 8 feet of mixed gravel and clay.

Depth to groundwater is estimated to be approximately 5 feet below the ground surface with flow toward the northeast.

As at other OU10 IHSSs, the PAHs were the most frequently detected organics in the surface soil (Plate 10). Concentrations were highest at two locations east of the IHSS, but these locations may be influenced by other sources outside IHSS 176. These locations, therefore, may not be directly associated with contamination migrating from the IHSS 176 source area. For locations within the IHSS, elevated concentrations are apparent in the northeast and northwest corners of the IHSS and in the west central region of the site. PAH concentrations were detected at lower levels surrounding these areas of concern and extending north/northeast of the site. Contaminant migration is likely associated with fugitive dust or tracking.

PCBs were also detected along the northern perimeter of the site and at two other locations: one at the western border and the other east of the site where PAHs were highest (Plate 10). Along the northern border, concentrations of PCBs are highest in the northwestern corner and decrease at the locations to the east, indicating migration along an easterly line. The other two locations may be associated with fugitive dust migration or separate sources.

Inorganics above background were found at levels in the same order of magnitude as background. The metals will remain in the soil unless chemical mixtures leading to speciation allow greater mobility. However, this does not occur at IHSS 176.

Soil-gas results indicated a potential contaminant plume east of the site (Plate 11). Benzene and toluene concentrations were found at several locations along the roadway east and northeast of the site. These data indicate possible subsurface migration of VOCs, although the source of these chemicals may be unrelated to the IHSS, particularly because the locations lie transverse to groundwater flow and are situated along a roadway.

5.2.6 IHSS 177 - Building 885 Drum Storage Area

The area around IHSS 177 gently slopes to the south and east. Approximately 12 feet of alluvium consisting of sandy gravelly clay overlie the bedrock in the vicinity of the site. Groundwater flows to the south and the depth to groundwater is estimated to be approximately 10 feet below the ground surface.

According to the site background, waste and unused oils were historically stored on the western portion of the IHSS. All five locations on the western side of the IHSS had detectable levels of PAHs, but the levels were not elevated when compared with RBCs (see Plate 13). PAHs are known to be associated with petroleum products, such as oil and gas, and with asphalt roads. They are persistent in soil and will normally adsorb to organic material in the soil.

Reported concentrations of PAHs at IHSS 177 may be associated with the asphalt layer and cannot definitively be attributed to the site. PAHs were not detected in previous soil investigations and detected concentrations do not correlate with the results of the soil-gas investigation. The highest PAH concentrations found in the ditch along the fenceline, south and southeast of the IHSS, are probably a result of soil erosion into the ditch.

All of the inorganics detected in this sampling event were also found during the previous investigation. The inorganics above background may be associated with fill material placed under the asphalt layer. None of the RBCs were exceeded when compared with the RI data. Concentrations of inorganics also do not correlate with the organic detections.

Volatiles detected in IHSS soil-gas sampling may be associated with past storage of paint and paint solvents. VOCs are usually highly soluble and will migrate by way of infiltration and percolation through the soil to the groundwater. Infiltration of precipitation can speed up this process. Dichloroethylene and acetone were detected in earlier soil investigations at the IHSS, although acetone was found at only one location during the RI. Dichloroethene was elevated at locations along the southern IHSS boundary with highest levels at location SS074493 (see Plate 13). A clear trend of its migration could not be delineated from the available data. Other detected volatiles did, however, show a pattern of subsurface movement.

Highest concentrations of tetrachloroethylene and trichloroethene were reported at soil-gas locations SS074493 and SS074193, respectively (see Plate 13). The tetrachloroethene data for location SS0774493 and surrounding locations indicate contaminant movement toward the south/southeast, the same direction of inferred groundwater flow. Soil-gas results indicate subsurface migration of volatile contaminants with probable groundwater flow direction. The elevated levels at locations SS074193 and decreasing concentrations of trichloroethene and tetrachloroethene at locations surrounding SS074193 and SS074493 may be associated with horizontal spreading within the vadose zone. The data also indicate that there may be more than one source area within the IHSS (Plate 13).

5.2.7 IHSS 181 - Building 334 Cargo Container Area

Surface soil sampling was not conducted at IHSS 181. Results of the soil-gas survey indicated the presence of methane but observed concentrations are likely associated with natural organic decay. Contamination does not appear to be present at IHSS 181.

5.2.8 IHSS 182 - Building 444/453 Drum Storage Area

IHSS 182 is nearly flat except for a small depression where surface water collects; the depression is located near the southwest corner of the site. The topography of the general area of the site gently slopes to the east and south. Approximately 25 feet of alluvium and fill overlie the bedrock in the vicinity of the site. Depth to groundwater is approximately 20 feet bgs with flow occurring toward the east.

Surface-soil was not sampled at IHSS 182 because the area is covered by a thick layer of asphalt. A soil-gas survey was completed and a number of VOCs were detected throughout the site and at locations outside the IHSS boundaries. Building 444 prevented further sampling toward the southeast. Highest concentrations were found in the northern portion of the site, north and northwest of Building 455. In particular this area had high levels of 1,1,1-TCA, TCE, PCE, and cis-1,2-DCE. The soil-gas data indicate contaminant migration toward the south/southeast, where these compounds were found at elevated concentrations. The volatiles found at the site are generally soluble and the apparent migration with groundwater flow is expected.

5.2.9 IHSS 205 - Building 460 Sump #3 Acid Side

No stains were observed at this IHSS; therefore, no surface-soil samples were collected. No soil-gas samples were collected per the OU10 Work Plan (DOE 1992a). Because there is no surface-soil data, fate and transport discussion will not be included in this technical memorandum.

5.2.10 IHSS 206 - Inactive D-836 Hazardous Waste Tank

The topography of IHSS 206 gently slopes to the north-northeast. Soil in the vicinity is alluvium, bedrock, and fill (DOE 1992a). Approximately 5 feet of alluvium and fill overlie bedrock. Groundwater flows to the northeast, and the depth to groundwater is estimated to be 15 feet bgs. The nearest well is approximately 750 feet from the site. No previous soil or groundwater investigations have been conducted at the site. Soil gas samples were not collected at this IHSS, per the OU10 Work Plan (DOE 1992a).

Metals above background in IHSS 206 surface soils were found at only two locations: SS010793 and SS011493. Concentrations did not exceed RBCs, and the analytical data indicate that metals are not likely site contaminants.

5.2.11 IHSS 207 - Inactive Building 444 Acid Dumpster

No stains were observed at this IHSS; therefore, no samples were collected. Because there is no surface-soil data, fate and transport discussion will not be included in this technical memorandum. Soil-gas samples were not collected, in accordance with the OU10 Work Plan (DOE 1992a).

5.2.12 IHSS 208 - Inactive 444/447 Waste Storage Area

The data do not indicate contamination at IHSS 208. Surficial soil samples were analyzed for metals and cyanide. There is no history of past waste spills or leaks. Soil-gas samples were not collected, in accordance with the OU10 Work Plan (DOE 1992a).

The general topography gently slopes to the east. Soil consists of alluvium, fill, and bedrock. Approximately 25 feet of alluvium and fill overlie bedrock in the vicinity of IHSS 208 (DOE 1992a).

The closest well is approximately 750 feet from the site. Groundwater flows to the east and intercepts the south Walnut Creek drainage. The depth of groundwater is estimated to be 20 feet bgs (DOE 1992a).

5.2.13 IHSS 210 - Unit 16, Building 980 Cargo Container

The topography of IHSS 210 gently slopes to the northeast and east. Less than 10 feet of alluvium and fill overlie the bedrock in the vicinity of the site. Depth of groundwater is approximately 10 feet below the ground surface. The groundwater flows to the southeast, intercepting the South Walnut Creek drainage.

Surface soil contamination at IHSS 210 consists primarily of PAHs. Concentration plots of IHSS 210 were presented on Plate 8. As shown on Plate 8, PAHs were highest at the western boundary in the middle of the site and appear to be migrating from this area. Lower concentrations and fewer hits were found north, east, and south of this area of concern. Chlorinated benzene compounds were found at the southeastern corner of the IHSS but not at any other location. These chemicals are likely to adsorb to organic materials in soil. Contaminants detected at the site are consistent with wastes historically stored there.

Metals detected above background will generally remain in soils. Calcium was highest at the offsite location to the south; this may be associated with fill materials used in areas near the site. Other metals exceeding background do not show a definitive migratory pattern. Soil-gas sampling results indicate possible subsurface VOC contamination (Plate 9), although a source designation related to the site would need further characterization.

5.2.14 IHSS 213 - Unit 15, 904 Pad Pondcrete Storage

IHSS 213 is an interim storage facility. It was not sampled during Phase I, Stage 1 field activity. Fate and transport discussion will not be included in this technical memorandum.

5.2.15 IHSS 214 - Unit 25, 750 Pondcrete and Saltcrete Storage

IHSS 214 is an interim storage facility. It was not sampled during Phase I, Stage 1 field activity. Fate and transport discussion will not be included in this technical memorandum.

6.0 RECOMMENDATIONS

This technical memorandum is intended to present Phase I, Stage 1 data and provide recommendations for subsequent stages of the RFI/RI. Recommendations for each IHSS are based on the results of nonintrusive or limited intrusive screening level surveys conducted for the Phase I, Stage 1 investigations. Analytical and survey data were summarized and assessed in Sections 3.0 and 4.0. A preliminary evaluation of the nature and extent of contamination at each IHSS was presented in Section 5.0.

The following paragraphs provide information on the IHSS remediaton category evaluation process completed in the *Proposed Plan for Reorganization and Remediation of the Industrial Area Operable Units* (DOE 1994a). The remediation categories and results of the Phase I, Stage 1 investigations are the basis for general recommendations for each IHSS. Exact numbers and locations of any recommended sampling will be identified in the Phase I, Stage 2 Work Plan.

Based on the assessment of Phase I, Stage 1 surface-soil data given in Section 4.3, it appears that the existing databases are generally sufficient for characterization of the means for most parameters in each of the IHSSs, at least for the slightly relaxed statistical parameters of $\alpha = 0.1$ and $d = 0.3$. In some cases, the statistical parameters would have to be relaxed even further, to as high as $x = 0.2$ and $d = 0.5$, but it was shown that when the data were compared to RBCs and background levels, the relaxed parameters were usually reasonable. However, in a few instances, the assessment concluded that additional data collection was needed in order to adequately characterize mean concentrations within an IHSS.

Data presented in the data summary in Section 3.0 were also examined for the need for further data evaluation. The IHSSs were specifically compared to the preliminary evaluation of each

IHSS in the *Proposed Plan for Reorganization and Remediation of the Industrial Area Operable Units at the Rocky Flats Environmental Technology Site* (DOE 1994a).

In the *Proposed Plan for Reorganization and Remediation of the Industrial Area Operable Units* (DOE 1994a), the IHSSs were evaluated against a standard set of criteria to assist in identifying those IHSSs that are candidates for closure or accelerated clean up. IHSSs rather than entire OUs were individually inspected based on the Observational Approach to streamline the environmental remediation of the Industrial Area. The Observational Approach is part of DOE's Streamlined Approach for Environmental Restoration (SAFER), which is designed to manage potential changes of previously planned work scopes based on the collection of new data. Changes in IHSS remediation categories can also occur based on changes to the regulatory climate, public opinion, DOE priorities, future land use, and other unresolved policies.

The remediation categories specified in the *Proposed Plan for Reorganization and Remediation of the Industrial Area Operable Units* (DOE 1994a) are (1) no further action (NFA) areas, (2) potential early action (PEA), (3) accelerated remedial/removal actions, and conventional RI/FS work, and (4) identification of or deferment until decontamination and decommissioning (D&D) of associated buildings.

The methodology to determine remedial action categories involved rating each IHSS according to specified criteria developed for RFETS given in the reference (DOE 1994a). Sixteen criteria were divided into three general factor groups: a safety factor group, a data factor group, and a remedial action factor group. Details of the scoring system and the categorization process are located in the *Proposed Plan for Reorganization and Remediation of the Industrial Area Operable Units at the Rocky Flats Environmental Technology Site* (DOE 1994a).

Some IHSSs may require additional limited field investigations to refine the site characterization and improve delineation of contaminant migration. At IHSSs recommended for PEAs, the IHSS will undergo a process that is substantially smaller in scope from a traditional RI/FS and the associated decision process. This can include hot spot removal, soil excavation, soil washing, or other remedial processes. PEA does not preclude the need for additional sampling in the IHSS; however, more samples may need to be collected both before and after an early removal action to verify that the remedial action selected is appropriate and to verify the effectiveness of the remediation. Some PEAs will be investigated and reevaluated for an NFA designation; or after new site data are evaluated, some IHSSs originally deferred for RI/FS will become PEAs (DOE 1994a).

Table 6-1 shows the remediation categories from the *Proposed Plan for Reorganization and Remediation of the Industrial Area Operable Units at the Rocky Flats Environmental Technology Site* (DOE 1994a) and the recommendations in this document for IHSS disposition based on current data. Recommendations are discussed on an IHSS-specific basis in the following sections.

6.1 IHSS 129 - OIL LEAK

Results of the analyses of surface-soil data for IHSS 129 are not yet available. These data will be included in the final draft, and recommendations will be suggested.

6.2 IHSS 170 - PROPERTY UTILIZATION AND DISPOSAL STORAGE YARD

IHSS 170 was placed in the PEA remediation category when evaluated for accelerated cleanup (DOE 1994a). Based on the data assessment in Section 4.0, sufficient surface-soil data generally appear to be available from the Phase I, Stage 1 sampling effort to characterize means of

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TABLE 6-1
Comparison of EG&G-Recommended Remediation Categories to Recommendations Based on Current Data for OU10 IHSSs

	IHSS	DESCRIPTION	CATEGORY	RECOMMENDATIONS BASED ON PHASE I, STAGE 1 RESULTS
10	129	Oil Leak	RI/FS or D&D	Information to be included in the final draft
10	170	PUD Yard	PEA	Additional sampling to define horizontal and vertical boundary of contaminants in support of PEA
10	174A	PUD Storage Areas	PEA	Additional sampling to define horizontal and vertical boundary of contaminants in support of PEA
10	174B	PUD Storage Areas	PEA	Additional sampling to define horizontal and vertical boundary of contaminants in support of PEA
10	175	Contractor Storage Facility	NFA	Additional sampling to define horizontal and vertical boundary of contaminants, possibly in support of PEA instead of NFA
10	176	S&W Yard	PEA	Additional sampling to define horizontal and vertical boundary of contaminants in support of PEA
10	177	885 Drum Storage Area	RI/FS or D&D	Additional sampling to define horizontal and vertical extent of contaminants and to determine samples for groundwater
10	181	334 Cargo Container Area	NFA	NFA
10	182	444/453 Drum Storage Area	RI/FS or D&D	Additional soil gas samples to define the horizontal and vertical extent of contamination
10	205	460 Sump 3-Acid	RI/FS or D&D	D&D
10	206	Inactive TK D-836	RI/FS or D&D	D&D
10	207	444 Acid Dumpster	RI/FS or D&D	D&D
10	208	944/447 Waste Storage Area	RI/FS or D&D	D&D
10	210	980 Cargo Container	NFA	Additional sampling to confirm presence or absence of volatiles and define surface soil contaminants in support of NFA
10	213	904 Pad	RI/FS or D&D	Additional sampling after storage facility is no longer in use
10	214	750 Pad	RI/FS or D&D	Additional sampling after storage facility is no longer in use

Reference: DOE 1994e

Notes:

NFA = No further action
PEA = Potential early action
PUD = Property Utilization and Disposal
RI/FS or D&D = Defer for RI/FS or transition to decontamination and decommissioning
S&W = Swingerton and Walberg

individual chemicals at IHSS 170, so long as the statistical constraints of desired confidence level (0.95) and maximum relative error (0.2) can be relaxed for some constituents. Levels of contamination found in surface-soils at IHSS 170 exceeded the RBC for benzo(a)pyrene and Aroclor-1254. A number of inorganics exceeded background concentrations, although available risk-based levels were not exceeded. VOCs from soil-gas sampling were found downgradient of the site, indicating possible subsurface migration of benzene, PCE, acetone, and 1,1,1-TCA. To justify a PEA at this IHSS, the lateral and vertical extent of chemical migration need to be more fully defined. The following paragraphs discuss recommendations for IHSS 170.

The statistical analysis in Section 4.3.2 indicated that the number of surface-soil samples collected in Phase I, Stage 1 would be sufficient to characterize the mean for distributions of all parameters except five SVOCs and eight metals, given the statistical constraints outlined in the OU10 Work Plan (confidence level of 0.95 and maximum relative error in estimating the mean of 0.2) (DOE 1992a). Given those statistical constraints, as many as 282 additional samples might be required for cadmium, and as many as 437 additional samples for bis(2-ethylhexyl) phthalate (Table 4-2). However, the number of required samples would be greatly reduced for relaxed statistical constraints. For a confidence level of 0.9 and an acceptable relative error of 0.3, the samples collected are sufficient to characterize the mean for all constituents except bis(2-ethylhexyl) phthalate, fluoranthene, phenanthrene, pyrene, lithium, cadmium, chromium, and nickel. However, up to 136 additional samples would be required to characterize the mean for these constituents. For a confidence level of 0.9 and an acceptable relative error of 0.5, 49 additional samples would be required for bis(2-ethylhexyl) phthalate, and sufficient data would be available for all other constituents; for a confidence level of 0.8, sufficient data are available for bis(2-ethylhexyl) phthalate. As noted in Section 4.3.2, a relative error of 0.5 should be acceptable for all of these parameters, except possibly phenanthrene and lithium, because the sample means for these constituents are well below the applicable RBCs and/or background

UTLs. This conclusion cannot be confirmed for phenanthrene and lithium because RBCs are not available for those constituents.

It is recommended that the required confidence level be reduced from 0.95 to 0.9 (and to 0.8 for bis[2-ethylhexyl] phthalate), and the acceptable relative error be increased to 0.3. It is further recommended that the required relative error be increased to 0.5 for bis(2-ethylhexyl) phthalate, fluoranthene, phenanthrene, pyrene, lithium, cadmium, chromium, and nickel. Then additional sampling would not be necessary to characterize constituent means at IHSS 170.

The evaluation of the nature and extent of contamination indicated that additional soil sampling should be conducted to examine potential subsurface concentrations of VOCs, PAHs, metals, and Aroclor-1254. Based on the soil-gas survey results and evidence of elevated PAHs in surface-soils in the eastern portion of the site, the area downgradient (east/northeast) of the stained soils should be sampled. Soil borings should be done to determine whether subsurface contamination is migrating from this area and to characterize the vertical extent of contamination. Characterization of subsurface-soils is also needed south of the stained area to examine the vertical extent of PAHs, Aroclor-1254, and lead. These areas of concern extend beyond the IHSS boundaries; therefore, sampling should be conducted beyond the established IHSS borders. Surface-soils should also be sampled at the designated boring locations to improve characterization of horizontal chemical movement. Groundwater sampling at upgradient wells and at the eastern end of the site should be performed to identify any contaminants that may be present in the upper aquifer and influencing soil-gas results.

Soil borings should also be placed in the central and western portions of the site for comparison purposes. Elevated PAHs were detected along the northern boundary of IHSS 170 on either side of IHSS 174B. The 174B PAH data collected at the northern boundary showed similar concentrations to the IHSS 170 data. Surface- and subsurface-soil sampling of the area of IHSS

170 adjacent to IHSS 174B and the area north of the two IHSSs should be performed to improve characterization of both IHSSs.

Anomalies are not suspected after review of the HPGe and NaI survey data. Therefore, additional analyses for radiological information is not recommended. Recommendations regarding IHSSs 174A and 174B are discussed in the following sections.

6.3 IHSS 174A - DRUM STORAGE AREA

IHSS 174A was placed in the PEA site remediation category (DOE 1994a). Evaluation of site data indicates additional characterization of the site is necessary for justification of a PEA. Concentrations of PAHs indicate surface-soil contaminant migration along a northeasterly line from IHSS 170 into the northwestern portion of IHSS 174A. Similar to recommendations for IHSS 170, subsurface-soil data should be sampled to determine the vertical extent of contamination of both the PAHs and Aroclor-1254. In addition, surface- and subsurface-soil samples should be collected west and southwest of IHSS 174A to encompass the lateral spread of this contamination.

Based on the data assessment in Section 4.3, sufficient surface-soil data generally appear to be available from the Phase I, Stage 1 sampling effort to characterize means of individual chemicals at IHSS 174A, if the statistical constraints of a desired confidence level (0.95) and maximum relative error in estimating the mean (0.2) could be relaxed for some constituents. However, further assessment of the distributions of lead, beryllium, and vanadium is required.

The statistical analysis in Section 4.3.3.1 indicated that the number of surface-soil samples collected in Phase I, Stage 1 would be sufficient to characterize the mean for distributions of all parameters except three SVOCs and seven metals, given the statistical constraints outlined in the

OU10 Work Plan (confidence level of 0.95 and maximum relative error in estimating the mean of 0.2) (DOE 1992a). Given those statistical constraints, as many as 945 additional samples might be required for vanadium and as many as 296 additional samples for bis(2-ethylhexyl) phthalate (Table 4-3). However, the number of required samples would be greatly reduced for relaxed statistical constraints. For a confidence level of 0.9 and an acceptable relative error of 0.3, sufficient samples have been collected to characterize the mean for all constituents except bis(2-ethylhexyl) phthalate, pyrene, beryllium, copper, lead, nickel, and vanadium. However, up to 296 additional samples would be required to characterize the mean for these constituents. For a confidence level of 0.8 and an acceptable relative error of 0.5, 55 additional samples would be required for beryllium, 27 for lead, and 65 for vanadium. As noted in Section 4.3.3.1, a relative error of 0.5 should be acceptable for bis(2-ethylhexyl) phthalate, pyrene, copper, and nickel because the sample means for these constituents are well below the applicable RBCs and/or background UTLs.

The distributions of beryllium, lead, and vanadium at IHSS 174A were investigated further by applying various tests for normality and preliminary geostatistical analyses. It was determined that the distributions of these metals appear to be neither normal nor log-normal, so the statistical tests used to estimate numbers of samples required are generally not applicable. The geostatistical analyses indicated that the data were consistent with a "hot spot," or localized area of elevated concentrations, in the northeastern quadrant of the IHSS. It is recommended that further geostatistical analyses be conducted after collecting additional surface-soil samples as described below.

It is recommended that the required confidence level be reduced from 0.95 to 0.9 (and to 0.8 for bis(2-ethylhexyl) phthalate), and the acceptable relative error be increased to 0.3. It is further recommended that the acceptable relative error be increased to 0.5 for pyrene, bis(2-ethylhexyl) phthalate, copper, and nickel. With these statistical constraints, no additional surface-soil samples would be required to characterize mean concentrations of any parameters except beryllium, lead, and vanadium. However, as noted below, additional surface- and subsurface-soil sampling is recommended to more fully assess the extent of metals and VOC contamination. A surface-soil sample should be collected at every subsurface-soil sampling location, and all surface-soil samples should be analyzed for the full suite of metals and SVOCs, as well as VOCs. This would provide additional surface-soil data to help characterize the distributions of beryllium, lead, and vanadium as well as the other metals and SVOCs for which relaxed statistical constraints have been recommended.

Because of the issues related to metals data and because subsurface VOC contamination was found north of the site, additional sampling of surface- and subsurface-soils should be conducted. Samples should be collected toward the northeast along the apparent surficial migration route and where VOCs were detected east of the site. Groundwater sampling toward the east/northeast is also recommended to examine whether groundwater contamination exists in the vicinity of the IHSS.

Anomalies are not suspected after review of the HPGe and NaI survey data; therefore, additional analyses for radiological information are not recommended.

6.4 IHSS 174B - DUMPSTER STORAGE AREA

This site also received a PEA designation (DOE 1994a); however, as at IHSSs 170 and 174A, additional characterization of site contamination is necessary. The statistical analysis in Section 4.3.3.2 indicated that the number of surface-soil samples collected in Phase I, Stage 1 is sufficient to characterize the mean for distributions of all parameters except six SVOCs, one PCB, and 13 metals, given the statistical constraints outlined in the OU10 Work Plan (confidence level of 0.95 and maximum relative error in estimating the mean of 0.2) (DOE

1992a). Given those statistical constraints, as many as 49 additional samples might be required for zinc, as many as 62 additional samples for Aroclor-1260, and as many as 56 additional samples for bis(2-ethylhexyl) phthalate (Table 4-4). However, the number of required samples would be greatly reduced for relaxed statistical constraints. For a confidence level of 0.9 and an acceptable relative error of 0.3, only 15 additional samples would be required to characterize the mean for all constituents except bis(2-ethylhexyl) phthalate and Aroclor-1260; however, up to 20 additional samples would be required to characterize the mean for these constituents. For a confidence level of 0.9 and an acceptable relative error of 0.5, no additional samples would be required. As noted in Section 4.3.3.2, a relative error of 0.5 should be acceptable for bis(2-ethylhexyl) phthalate, fluoranthene, pyrene, and zinc because the sample means for these constituents are well below the applicable RBCs and/or background UTLs. A relative error of 0.5 should also be acceptable for phenanthrene and magnesium, although this conclusion cannot be confirmed because there are no RBCs for these constituents.

It is recommended that the required confidence level be reduced from 0.95 to 0.9 and the acceptable relative error be increased to 0.3. It is further recommended that the required relative error be increased to 0.5 for bis(2-ethylhexyl) phthalate, fluoranthene, phenanthrene, magnesium, pyrene, and zinc. With these statistical constraints, no additional surface-soil sampling would be required to characterize mean concentrations of any constituents except PCB-1260.

Additional statistical and geostatistical analyses were conducted for PCB-1260 because it did not appear that the acceptable relative error in the mean (d) could be reasonably increased to 0.5. These analyses indicated that PCB-1260 concentrations did not appear to be distributed normally or log-normally within the IHSS, but did appear to be consistent with an isolated "hot spot" extending from east to west through the center of the IHSS. This trend of elevated concentrations does not appear to extend into adjacent portions of IHSS 170. It is recommended that further geostatistical analyses be conducted after collecting additional surface-soil samples as described below.

As discussed in the recommendations for IHSS 170, additional soil data should be collected in the area north of the northern boundary of IHSSs 170 and 174B. Because PAH contamination exists at all of the sample locations at IHSS 174B, with some locations exceeding the risk-based level, and because Aroclor-1260 and -1254 were found above the risk-based concentration along the southern and eastern boundaries of the site, soil sampling should be extended beyond the IHSS borders. This would allow better characterization of the lateral extent of site contamination. This sampling should be coordinated with additional sampling in IHSS 170. Subsurface-soil data should also be collected to determine whether vertical migration has occurred.

Soil-gas data did not indicate subsurface VOC contamination associated with the site. However, groundwater sampling may aid in determining whether contaminants have leached from subsurface soil into the upper aquifer and whether an upgradient source may exist west of the area of stained soils.

Anomalies are not suspected after review of the HPGe and NaI survey data; therefore, additional analyses for radiological information are not recommended.

6.5 IHSS 175 - SWINGERTON AND WALBERG BUILDING 980 CONTAINER STORAGE FACILITY

An NFA categorization was given to IHSS 175 (DOE 1994a). Based on the assessment of Phase I, Stage 1 data, sufficient surface-soil data generally appear to be available to characterize means of individual chemicals at IHSS 175, if the statistical constraints of a desired confidence level (0.95) and maximum relative error (0.2) could be relaxed for some constituents.

The statistical analysis in Section 4.3.4 indicated that the number of surface-soil samples collected in Phase I, Stage 1 would be sufficient to characterize the mean for distributions of eight metals, given the statistical constraints outlined in the OU10 Work Plan (confidence level of 0.95 and maximum relative error in estimating the mean of 0.2) (DOE 1992a). Given those statistical constraints, as many as 93 additional samples might be required for calcium, as many as 47 additional samples for silver, and as many as 67 additional samples for fluoranthene (Table 4-5). However, the number of required samples is greatly reduced for relaxed statistical constraints. For a confidence level of 0.9 and an acceptable relative error of 0.3, only 17 additional samples would be required to characterize the mean for all constituents except calcium and fluoranthene; however, up to 29 additional samples would be needed for calcium and up to 21 additional samples would be required for fluoranthane. For a confidence level of 0.9 and an acceptable relative error of 0.5, no additional samples would be required. As noted in Section 4.3.4, a relative error of 0.5 should be acceptable for all of the SVOCs except possibly phenanthrene, and all of the metals except possibly calcium, because the sample means for these constituents are well below the applicable PBCs and/or background UTLs. A relative error of 0.5 should also be acceptable for phenanthrene and calcium, although this conclusion cannot be confirmed because there are no RBCs for these constituents.

It is recommended that the required confidence level be reduced from 0.95 to 0.9, and the acceptable relative error be increased to 0.3. It is further recommended that the acceptable relative error be increased to 0.5 for benzo(b)fluoranthene, chrysene, fluoranthene, phenanthrene, pyrene, cadmium, calcium, and silver. Additional sampling does not appear necessary to characterize constituent means at IHSS 170.

Because PAHs were detected above RBCs in the southern portion of the site and beyond the southern boundary, additional characterization of the lateral and vertical extent of contamination should be conducted to justify an NFA designation during Phase I, Stage 2 investigations. Soil borings should be placed at the IHSS to evaluate possible subsurface PAH or VOC contamination. One soil-gas sample in the northwestern corner of the site indicated the presence of cis-1,2-DCE. Further examination of subsurface VOC contamination should be conducted to verify the extent of contamination.

Anomalies are not suspected after review of the HPGe and NaI survey data; therefore, additional analyses for radiological information are not recommended.

Additional surface-soil samples should also be collected south of the site, down the hillside where contaminants may be migrating with runoff or erosion, and wherever a boring is placed. Sediment in the drainage at the base of the slope should also be sampled; another boring should also be placed in this area.

6.6 IHSS 176 - SWINGERTON AND WALBERG CONTRACTOR STORAGE YARD

IHSS 176 was categorized as a PEA (DOE 1994a). OU4 (Solar Ponds) is adjacent to the west of this site, and IHSS 165 of OU6 overlaps the eastern portion of the site. Limited data for IHSS 165 were available for input to the IHSS 176 characterization. These data were included in Appendix B for informational purposes only. Although the following recommendations are discussed for IHSS 176, investigations of soil or groundwater contamination in the vicinity of IHSS 165 will be considered for planning of additional sampling efforts.

The statistical analysis in Section 4.3.5 indicated that the number of surface-soil samples collected in Phase I, Stage 1 would be sufficient to characterize the mean for distributions of 12 metals, given the statistical constraints outlined in the OU10 Work Plan (confidence level of 0.95 and maximum relative error in estimating the mean of 0.2) (DOE 1992a). Given those statistical constraints, as many as 102 additional samples might be required for arsenic and as many as 409 additional samples for fluoranthene (Table 4-6). However, the number of required samples would be greatly reduced for relaxed statistical constraints. For a confidence level of 0.9 and an acceptable relative error of 0.3, only 32 additional samples would be required to characterize the mean for metals, although up to 128 additional samples would be required to characterize the mean for SVOCs. For a confidence level of 0.9 and an acceptable relative error of 0.5, 32 additional samples would be required for pyrene, 38 additional samples for phenanthrene and 46 additional samples for fluoranthene; no additional samples would be required for any other constituents. If the confidence level were reduced to 0.8, no additional sampling would be required for any constituents. As noted in Section 4.3.5, a relative error of 0.5 should be acceptable for all of the SVOCs except benzo(a)pyrene and possibly phenanthrene because the sample means for these constituents are well below the applicable RBCs and/or background UTLs. This conclusion cannot be confirmed for phenanthrene because there is no RBC for this constituent. A relative error of 0.5 should also be acceptable for all of the metals except arsenic.

It is recommended that the required confidence level be reduced from 0.95 to 0.9, and the acceptable relative error be increased to 0.3. It is further recommended that the acceptable relative error be increased to 0.5 for cesium and all of the SVOCs except benzo(a)pyrene, and that the required confidence level be reduced to 0.8 for fluoranthene, phenanthrene, and pyrene. No statements can be made regarding reasonable numbers of additional samples for arsenic and benzo(a)pyrene.

Additional statistical and geostatistical analyses were conducted for arsenic and benzo(a)pyrene because it did not appear that the acceptable relative error in the mean (d) could be reasonably increased to 0.5 for these constituents. These analyses indicated that arsenic concentrations did not appear to be distributed normally or log-normally within the IHSS, but did appear to be consistent with an isolated "hot spot" in the southwest quadrant of the IHSS. Benzo(a)pyrene concentrations also did not appear to be distributed normally or log-normally within the IHSS, nor was any particular spatial distribution apparent. It is recommended that further geostatistical analyses be conducted after collecting additional surface-soil samples as described below.

Subsurface soils within and surrounding the site should be sampled to determine whether possible vertical contamination exists. Borings should be placed in the central region of the site where PAHs are highest, to the northeast along the groundwater flow direction, and to the west/northwest where both benzo(a)pyrene and Aroclor-1260 were elevated. Additional subsurface-soil data are needed to identify the source of VOC contaminants detected in soil-gas results east of the IHSS. Surface-soil samples should also be collected at each subsurface-soil sampling location to provide additional data to help assess arsenic and benzo(a)pyrene distributions.

The elevated activities in IHSS 176 detected by the HPGe survey are probably due to "shine" from Building 964 and the solar evaporation ponds. Further, potentially contaminated equipment stored in the yard could also skew the results. However, it is recommended that further radiological investigation be conducted in IHSS 176 to verify the absence of anomalies. First, a more comprehensive NaI survey should be performed to identify potential contamination. If the NaI survey identifies potential contamination that cannot be attributed to "shine", then selected locations should be sampled for a vertical soil profile analysis using a laboratory HPGe.

Further recommendations should incorporate findings of investigations conducted for OU4 and OU6.

6.7 IHSS 177 - BUILDING 885 DRUM STORAGE AREA

IHSS 177 was recommended to be deferred to the RI/FS (DOE 1994a). The statistical analysis of Section 4.3.6 indicated that the number of surface-soil samples collected in Phase I, Stage 1 is sufficient to characterize the means for distributions of 10 of the metals, given the statistical constraints outlined in the OU10 Work Plan (confidence level of 0.95 and maximum relative error in estimating the mean of 0.2) (DOE 1992a). Given those statistical constraints, as many as 318 additional samples might be required for pyrene, and as many as 135 additional samples for zinc. (Table 4-7). However, the number of required samples is greatly reduced for relaxed statistical constraints. For a confidence level of 0.9 and an acceptable relative error of 0.3, the data are sufficient to characterize the means for all constituents except bis(2-ethylhexyl) phthalate, phenanthrene, pyrene, calcium, chromium, lead, and zinc; however, up to 99 additional samples would be required to characterize the means for SVOCs, and up to 42 additional samples for zinc. As noted in Section 4.3.6, the number of samples collected is sufficient for bis(2-ethylhexyl) phthalate for a confidence level of 0.9 and a relative error of 0.5, and these statistical parameters are reasonable for this parameter. Similarly, no additional samples would be needed for calcium, chromium, lead, and zinc for a relative error of 0.5 and a confidence level of 0.9 for calcium and chromium and 0.8 for lead and zinc. Based on comparisons with RBCs and background UTLs, these relaxed statistical constraints are not unreasonable for these metals (Section 4.3.6). Although this conclusion appears to be appropriate for calcium and lead, it cannot be confirmed because there are no RBCs for these metals.

It is recommended that the required confidence level be reduced from 0.95 to 0.9 (and to 0.8 for lead and zinc) and the acceptable relative error be increased to 0.3. It is further recommended that the required relative error be increased to 0.5 with a confidence level of 0.9 for bis(2-ethylhexyl) phthalate, calcium, chromium, lead, and zinc.

Further assessment of the distributions of phenanthrene and pyrene was conducted for IHSS 177. It was determined that concentrations of these compounds appear to be drawn from a log-normal distribution. The assessment of numbers of physical samples required, when applied to logarithms of the concentrations of these compounds, indicates that a sufficient number of samples has been collected. As noted below, these SVOCs probably exist because of the presence of asphalt at the site, rather than environmental contamination resulting from waste handling or spills or leaks of hazardous materials.

HPGe data did not reflect any anomalous readings; therefore, additional analyses for radiological information are not recommended.

Evaluation of available RI data indicate that further evaluation of subsurface contamination is necessary. Surface soils are probably affected by contaminants associated with the asphalt layer overlying the site rather than historical leaks or spills. The extent of volatile contaminant migration should be further characterized to the west and southwest beyond soil-gas location 741 and toward the south of the IHSS where contaminants appear to be migrating. Additionally, groundwater sampling should be undertaken to verify the lack of groundwater contamination in the shallow aquifer.

6.8 IHSS 181 - BUILDING 334 CARGO CONTAINER AREA

An NFA categorization was given to IHSS 181 (DOE 1994a). This is consistent with results of preliminary RI sampling presented in this report.

HPGe data did not reflect any anomalous readings. Soil-gas results indicated no volatile organics except minor concentrations of methane that are present in concentrations greater than the target detection limit. The results of these findings indicate no further action is necessary at this IHSS.

6.9 IHSS 182 - BUILDING 444/453 DRUM STORAGE AREA

IHSS 182 was recommended to be deferred to the RI/FS (DOE 1994a). Further characterizations of VOC contamination at and around IHSS 182 is necessary to identify other sources that may be impacting the site and to verify the extent of contaminant migration toward the southeast. This IHSS may be affected by contaminants migrating from OU12 IHSSs in the area. When the sampling activities are defined for Phase I, Stage 2, the OU12 soil-gas survey results will be examined to clarify data needs.

The HPGe survey results indicated that uranium-235 and uranium-238 appear to have elevated activities in IHSS 182. While these elevated activities may be attributed to "shine" from Building 444 and/or from a localized source near a paint spot on the asphalt, further radiological investigation is recommended to confirm these hypotheses. A more comprehensive NaI survey is recommended; based on the NaI survey findings, vertical soil profile samples should be collected for analysis using a laboratory HPGe.

6.10 IHSS 205 - BUILDING 460 SUMP #3 ACID SIDE

The three acid sump tanks were visually inspected and no staining was observed in their vicinity; therefore, no samples were collected. It is recommended these tanks be transitioned to D&D. This is consistent with the categorization given to IHSS 205 for deferral to Transition/D&D (DOE 1994a).

No HPGe survey was conducted within IHSS 205, but the data from an HPGe location for OU12 (Station I-12), which is about 50 feet from IHSS 205, was found to have elevated activities of uranium-235 and -238. It is recommended that a comprehensive NaI survey be performed at IHSS 205 and that vertical soil profiles be collected at locations indicated by the NaI survey as potentially contaminated since no reliable radiological investigation has been conducted specifically for IHSS 205.

6.11 IHSS 206 - INACTIVE D-836 HAZARDOUS WASTE TANK

IHSS 206 was given a defer categorization and recommended for the normal RI/FS process (DOE 1994a).

The statistical analysis in Section 4.3.10 indicated that the number of surface-soil samples collected in Phase I, Stage 1 is sufficient to characterize the means for distributions of all of the metals except copper, sodium, and zinc, given the statistical constraints outlined in the OU10 Work Plan (confidence level of 0.95 and maximum relative error in estimating the mean of 0.2) (DOE 1992a). Given those statistical constraints, only 14 additional samples would be required for copper, 13 for sodium, and as many as 54 additional samples for zinc. (Table 4-8). However, the number of required samples would be greatly reduced for relaxed statistical constraints. For a confidence level of 0.9 and an acceptable relative error of 0.3, the number of samples collected would be sufficient for all parameters except zinc, and only 17 additional samples would be required to characterize the mean for zinc. If the acceptable relative error is increased to 0.5, no additional sampling would be required. As discussed in Section 4.3.10, relaxing the statistical constraints to these levels is not unreasonable for zinc, so no additional sampling would be required.

It is recommended that the required confidence level be reduced from 0.95 to 0.9 and the acceptable relative error be increased to 0.3. It is further recommended that the required relative error be increased to 0.5 for zinc. No additional sampling would be required to reasonably characterize the means for distributions of all metals at IHSS 206.

HPGe survey results will be analyzed as soon as the data is available for IHSS 206 and recommendations will be developed at that time.

6.12 IHSS 207 - INACTIVE BUILDING 444 ACID DUMPSTER

The former acid dumpster site was inspected. Visual inspection indicated no breakage or leakage; therefore, no samples were collected. It is recommended this IHSS be transitioned to D&D. This is consistent with the recommendation for deferral to transition/D&D (DOE 1994a).

The HPGe survey results for IHSS 207 indicated that thorium-232 and americium-241 appear to have elevated activities. Although these elevated activities may be attributed to "shine" from Building 664, further radiological investigation is recommended to confirm this hypothesis. A more comprehensive NaI survey is recommended; based on the NaI survey findings vertical soil profile samples should be collected for analysis using a laboratory HPGe.

6.13 IHSS 208 - INACTIVE 444/447 WASTE STORAGE AREA

The statistical analysis in Section 4.3.12 indicated that the number of surface-soil samples collected in Phase I, Stage 1 is sufficient to characterize the means for distributions of six of the metals, given the statistical constraints outlined in the OU10 Work Plan (confidence level of 0.95 and maximum relative error in estimating the mean of 0.2) (DOE 1992a). Given those statistical constraints, as many as 27 additional samples would be required (Table 4-9). However, the number of required samples would be greatly reduced for relaxed statistical constraints. For a confidence level of 0.9 and an acceptable relative error of 0.3, the number of samples collected would be sufficient for all but 11 parameters. If the acceptable relative error is increased to 0.5, no additional sampling would be required. As discussed in Section 4.3.12, relaxing the statistical constraints to these levels is not unreasonable for most of the parameters, but additional samples would be required for arsenic, beryllium, copper, and zinc.

It is recommended that the required confidence level be reduced from 0.95 to 0.9 and the acceptable relative error be increased to 0.3. It is further recommended that the required relative error be increased to 0.5 for aluminum, cobalt, lead, mercury, selenium, silver, and sodium. At least seven additional samples are required to reasonably characterize the means for distributions of arsenic, beryllium, copper, and zinc at IHSS 208. Additional sampling at IHSS 208 should be coordinated with OU12 sampling efforts in the area.

No HPGe survey data was collected specifically for IHSS 208, but two stations are within 75 feet. Both survey locations identified elevated activities for uranium-238: the more remote location identified elevated uranium-235 activity and the closer survey station reported uranium-235 within the range of background. Although it is hypothesized that these elevated activities are due to "shine" either from Building 444 or from an area of asphalt located near the IHSS, it is recommended that further radiological investigations be conducted specifically for this IHSS to confirm that no anomalies exist.

6.14 IHSS 210 - UNIT 16, BUILDING 980 CARGO CONTAINER

IHSS 210 was categorized as an NFA area (DOE 1994a). Surface-soil data collected for this site may support an NFA designation. Sufficient surface-soil data generally appear to be available from the Phase I, Stage 1 sampling to characterize the means of individual chemicals at IHSS 210, if the statistical constraints of a desired confidence level (0.95) and maximum relative error (0.2) can be relaxed for some constituents.

The statistical analysis of Section 4.3.13 indicated that the number of surface-soil samples collected in Phase I, Stage 1 would be sufficient to characterize the mean for distributions of seven metals, given the statistical constraints outlined in the OU10 Work Plan (confidence level of 0.95 and maximum relative error in estimating the mean of 0.2) (DOE 1992a). Given those statistical constraints, as many as 114 additional samples might be required for cadmium, and as many as 82 additional samples for fluoranthene (Table 4-10). However, the number of required samples would be greatly reduced for relaxed statistical constraints. For a confidence level of 0.9 and an acceptable relative error of 0.3, the number of samples is sufficient to characterize the mean for all constituents except fluoranthene, pyrene, cadmium, calcium, copper, nickel, sodium, and zinc; however, up to 36 additional samples would be required to characterize the mean for these constituents. For a confidence level of 0.9 and an acceptable relative error of 0.5, only 13 additional samples would be required for cadmium, and sufficient data would be available for all other constituents. As noted in Section 4.3.13, a relative error of 0.5 should be acceptable for fluoranthene, pyrene, cadmium, calcium, sodium, nickel, and zinc because the sample means for these constituents are well below the applicable RBCs and/or background UTLs. This conclusion appears to be reasonable for calcium and sodium, but cannot be confirmed because there are no RBCs for these metals.

It is recommended that the required confidence level be reduced from 0.95 to 0.9 (and to 0.8 for cadmium), and that the acceptable relative error be increased to 0.3. It is further recommended that the acceptable relative error be increased to 0.5 for fluoranthene, pyrene, cadmium, calcium, copper, nickel, sodium, and zinc. Additional sampling would not be necessary to characterize constituent means at IHSS 210.

HPGe data did not reflect any anomalous readings. Additional sampling for radionuclides is not recommended.

Although PAHs were found throughout the site, most levels were low (less than the RBC) and only one location had benzo(a)pyrene concentrations of concern. PAHs do not appear to be migrating over the hillside toward the drainage ditch as they have at IHSS 175. The elevated level on the west-central side of the site could be associated with PAHs atmospherically transported from IHSS 175. Additional sampling between the two IHSSs would be beneficial for characterizing this potential route of migration.

Chlorinated benzenes and dimethylphenol were detected in the southeastern corner of the site. Additional surface- and subsurface-soil sampling would be useful in this area to verify the presence or absence of these chemicals for the NFA designation. Furthermore, subsurface-soil sampling for VOCs would also improve source characterization for the chemicals detected in soil-gas sampling.

6.15 IHSS 213 - UNIT 15, 904 PAD PONDCRETE STORAGE

The elevated activities of americium-241 and uranium-235 are probably due to "shine" from the 904 pad, which stores low-level radioactive waste. However, it is recommended that further radiological investigation be conducted to confirm the absence of anomalies in the soil. This investigation should be deferred until the 904 storage facility becomes inactive. Surface-soil and soil-gas samples were not collected at this IHSS.

IHSS 213 was deferred to the normal RI/FS process (DOE 1994a). IHSS 213 is an active storage unit and is therefore a potential source of contamination. Soil-gas and surface-soil sampling should be conducted to characterize the site after the storage facility becomes inactive.

6.16 IHSS 214 - UNIT 25, 750 PONDCRETE AND SALTCRETE STORAGE

IHSS 214 was deferred to the normal RI/FS process (DOE 1994a).

The elevated activities of americium-241 and uranium-235 are probably due to "shine" from the 750 pad, which stores pondcrete (a mixed low-level radioactive waste). However, it is recommended that further radiological investigation be conducted to confirm the absence of anomalies in the soil. This investigation should be deferred until the 750 storage facility becomes inactive. Surface-soil and soil-gas samples were not collected at this IHSS.

IHSS 214 is an active storage unit and is therefore a potential source of contamination. Soil-gas and surface-soil sampling should be conducted to characterize the site after the storage facility becomes inactive.

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